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TUBERCULOSIS IN THE TROPICS.

PART II*

THE CONTROL OF TUBERCULOSIS IN THE TROPICS.

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Control of Tuberculosis in the Tropics.

In dealing with the control of tuberculosis in the tropics we have to visualize a variety of situations, methods that would be of avail in an urbanized or semi-urbanized community composed of races partly immunized by centuries of exposure, would prove worse than useless in a primitive community in whose midst the disease is beginning to make headway. Further, any methods of prevention must be outlined in relation to the existence of other preventable disease, the tropical sanitarian is beset with so many problems in respect to the prevention of disease that the addition of yet another bids fair to be the straw that broke the camel's back. However, the basis of anti-tuberculosis measures differs in no respect from that for other diseases namely, good housing, correct feeding and sound sanitation. As CROCKET (1933) puts it, tuberculosis is an index disease pointing to the conditions of life and work prevailing in any region. When the death rate for tuberculosis is falling it is proof that sanitation is receiving efficient attention on the part of the responsible authority.

There are some workers who would leave the matter in the hands of the sanitarians, as they are convinced that essential sanitary reforms, even in the absence of specific measures, will suffice to eradicate the malady in time. WINCHESTER (1934) draws attention to the fact that the tuberculosis death rate in the Straits Settlements has steadily diminished since the early years of this century, moreover its decline has been steeper than that of the general death rate. The fall has been most marked in Singapore Island where the percentage of people living under rural conditions is low. He maintains that any anti-tuberculosis measures apart from housing and town planning schemes are of little avail. The process of urbanization will, he thinks, solve the problem by allowing a more complete infection of all the population

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and thus hasten the elimination of the weakly immune. As it has taken the Jews two thousand years to attain this stage it would appear desirable to, at least, attempt to reach it somewhat earlier.

Control of Bovine Tuberculosis in the Tropics.

Before considering the human aspect of the problem it is necessary to mention the need for veterinary prophylaxis. In many colonies, particularly in Africa, a strict watch is being maintained on the incidence of tuberculosis in cattle. That this is essential is shown by the comparatively high rate of infection amongst the cattle in British Guiana, the disease has now been allowed to spread to such an extent that eradication by slaughtering will be an expensive measure. Consistent and wide scale tuberculin testing, even though it may appear expensive, will pay in the end if it eliminates the few infected beasts before the disease commences to spread. Nor should the thorough testing of imported cattle be omitted, since importation of bulls from the United Kingdom is often carried out in order to improve the local breeds. Even where milk is not an article of diet the persistent propaganda of health departments that milk is the perfect food is introducing the milk drinking habit, and to replace malnutrition by bovine tubercle, will not reflect credit on any propagandist. The time is ripe for more attention to be paid to this question, lest it produces another problem for the tropical hygienist.

Control of Tuberculosis in Backward Communities.

Communities are still to be found where ignorance and prejudice prevail to such an extent that any measure of control appears almost impossible of application. The first point to consider is whether tuberculosis exists to any great extent in such a community. The hospital records are not always to be depended on to furnish very accurate returns, in the first place, the rapidly fatal case common in primitive communities never enters hospital; secondly, with a busy out-patient department and crowded wards differential diagnosis is not easy and the diagnosis of bronchitis not infrequently conceals the damage which should be laid to the credit of tuberculosis. The only certain methods of ascertaining, with some degree of accuracy, the amount of tuberculosis present are by tuberculin test and post mortems. The technical difficulties in the way of tuberculin testing have already been discussed and their solution by the adoption of new methods advocated. Local prejudice is less easy of solution, but as long as schools, police forces and jails exist, material will be found for investigation. Where an aversion to the introduction of medicines under the skin is met with Craig's test is especially useful, as the extra O.T. is wiped off and the puncture does not appear to the untrained observer to introduce the material into the body. Actually, in most parts of the tropics, injections are largely demanded by the inhabitants who see in this method of administering medicaments a great improvement on the old-fashioned way of merely swallowing them so that intradermal tests should not arouse any great antipathy.

The acquisition of information through the medium of post mortems is sadly hampered in many parts, especially where the population is of the Mohammedan faith. Routine autopsies are out of the question, but the keen medical officer will always be on the look-out for opportunities furnished by post mortems required to be done in the interests of the law. The records of these can furnish a good deal of information

if they are performed with an eye to general interest as well as the ascertainment of the actual cause of death. Again, a considerable amount of information may be acquired by the use of the X-ray. It is true there are still areas where no X-ray apparatus is available, but these are becoming fewer in number, and time spent on carrying out as large a series of screenings as possible would yield a great deal of valuable information. The correct assessment of the presence or absence of thoracic disease requires practice but experience soon brings a reasonably high standard of proficiency. Nowadays, there are screens on the market which give as clear a picture as one could possibly desire.

Once information has been acquired regarding the amount and type of tuberculosis present measures have to be considered in relation to the control of the disease if it is, or threatens to be, a public health problem of any magnitude. In work of this nature there is only one royal road to success and that is concentration on the family as a unit, not the infected individual alone.

This is especially necessary in communities where the people live in rural or semi-rural conditions. As soon as an open case is detected, every effort should be made to carry out as efficient isolation as may be obtained. Conditions vary so much that it would be foolish to lay down any specified methods, there are places where the disease is regarded with so much horror that the unfortunate sufferer is practically left to care for himself; elsewhere no notice is taken of the condition and the whole family is exposed to intense infection. As far as possible two measures should be enforced, namely, the cleanly disposal of sputum and the placing of the patient in the open air for as many hours of the day as possible, but guarded from the direct rays of the sun. In some cases an ordinary calabash filled with wood ash forms an excellent receptacle for sputum or an issue of old tins containing a small amount of liquid disinfectant will suffice. Where feasible the contacts should be tuberculin tested and screened and the regular issue of a little medicine, especially cod-liver oil, to the children, often suffices to ensure their regular attendance at a hospital out-patient department for a considerable period, thus enabling them to be kept under observation.

In a community such as outlined here, the tuberculosis dispensary can serve no good purpose, its place as a clearing centre can be filled to better purpose by the district hospital. To set up a dispensary before its proper function is appreciated by the population it is intended to serve would merely be a waste of time and money. It resolves itself into keeping up another out-patient department, as those with all and every ailment would go to it for treatment. Once simple anti-tuberculosis measures are set going over a wide area and the inhabitants begin to appreciate their significance then the time is ripe for the first step in organized work, the erection of the tuberculosis dispensary. Nor does this entail considerable expense: the erection of a simple structure with room for expansion is much more desirable than the usual type where limited waiting accommodation aids the spread of infection; here patients, healthy adults and children may have to crowd in together and the dispensary unwittingly becomes the centre for further dissemination of infection. The best type of building is that built well off the ground so that shelter from rain or sun may be obtained under the structure with no restriction on ventilation. It should be in a central position, easy of access, though not on too

commanding a site in order to avoid attracting undesirable publicity. On the other hand, to site such a dispensary in some remote corner on the farther edge of town or village, encourages people to be secretive, and the idea that tuberculosis is something to be ashamed of gains ground.

In the early stages any attempt at introducing treatment requiring regular attendance is likely to meet with failure ; the unsophisticated native is at a loss to understand either the nature of the treatment or the need for its repetition. A judicious selection of cases with minimal progressive lesions for treatment by phrenic evulsion is recommended, it only requires a few successes to induce others to come forward. Even in these more backward communities there is always one section that will respond to intelligent propaganda and seek treatment, namely the clerical and administrative subordinate staff and school teachers. If a start can be made by detecting early cases amongst this class and active collapse instituted, the results will attract widespread attention. Patients drawn from this class ensure better results, they are capable of understanding the principles of treatment and their circumstances are such as to permit of rest for a prolonged period and a reasonable standard of nourishment. Such cases amply repay the trouble and care expended on them if they are carefully selected and their progress attentively watched. One demonstration of the efficacy of artificial pneumothorax is worth a score of hygiene talks. Hitherto, in many parts even amongst the educated natives, their attitude has been that tuberculosis is one hundred per cent. fatal and while they may seek advice it is only in the last stages when despair drives them to try medicines, in which they have no real faith. The infiltration of the news amongst the better educated portions of the populace soon extends even to the most ignorant.

Once the desire for treatment is aroused in the minds of the people the question is how to carry out such treatment in circumstances that will make the patient feel at ease and yet will enable the medical man to administer it under optimum conditions. The answer appears to be the setting up of small communities where sufferers may live under conditions resembling their habitual environment and yet permitting of reasonable isolation and continued attention. Cummins (1935) describes the work of Swiss missionaries in Portuguese East Africa who have developed a " tuberculosis village " in which the patients are cared for and fed by their own relatives, and yet treated and supervised by medical men who understand them and can fathom their prejudices and anxieties, instilling confidence in them by this appreciation of their mental processes. The huts are inexpensive to construct, and when vacated on account of death or removal can be burnt down.

Stones (1932) discussing the problem of tuberculosis in Uganda suggests that sanatorium treatment will not suit African needs, but village settlements appear to be the solution. The patient, once treatment is successfully under way, could carry on trades as is done in settlements at home, especially such employment as is suited to his needs and training. He quotes the suitability of experimental small-holding schemes of the Uganda Department of Agriculture for such settlements. He puts the matter very aptly when he says " segregation with contentment should be our watchword." The excellent work done by missions in connexion with the maintenance and treatment of lepers might well be extended to village settlements for the tuberculous.

The above measures, elementary though they appear, if energetically carried out should have a decisive effect in checking the extension of the active disease. In no part of the world save, perhaps, amongst a few primitive hill tribes or remote jungle dwellers, will tuberculosis ever sweep through the community as it did among the North American Indians, infection is now too general. KLEINE (1930) commenting on anti-tuberculosis work carried on in Africa, with especial reference to that of WILCOCKS, asserts that any fear of the disease assuming epidemic proportions, even in remote regions of East Africa, is groundless. The slow gradual infection of whole populations that is taking place is a sufficient guarantee against the repetition of the disasters seen in the past.

Control of Tuberculosis in Developing Communities.

As these communities develop and present possibilities of gain to the pioneers of commerce and industry, the problems of defence against tuberculosis become more difficult. One of the most important sources of infection from outside is the entrance of the petty trader, so often one of the Oriental races, who carries with him the organisms of disease readily enough but fails to bestow along with these unwelcome gifts those elements necessary for rapid and effective immunization. This invasion, mainly by Indian and Arab traders, is general throughout Africa. RODHAIN (1928) was of the opinion that the disease was spread in Belgian Congo by Arabs and Baluchi traders as well as by Europeans. Elsewhere the same process has been observed. The writer has had clear evidence of the spread of tuberculosis through an area in British North Borneo, densely populated by a primitive tribe, following the setting up of shops by Chinese traders. In areas where traders are already established in large numbers little can be done in the way of special prevention by forbidding their entry, but in sheltered communities any infiltration by such traders ought to be more strictly controlled by the medical department.

The part that should be played by Government control during this evolutionary process is admirably set out by YOUNG (1934) who, as the result of his experience in West Africa, affirms the theory that equality cannot be present as between immune and non-immune peoples. This lack of resistance clearly renders rapid urbanization a most undesirable process for native races. Young would reverse the usual process of bringing the native to the city by erecting townships in outlying districts. In planning for these, the density of the population would be limited by restricting the number of buildings to be erected on any given area. Moreover, he would place upon industry the burden of housing its workers in decent manner. These two measures would lead to the setting up of small townships extending out into the bush instead of becoming grossly overcrowded at the centre. No industrial concern would be allowed to commence operations until it owned, or obtained an option on, land in its immediate vicinity to supply sufficient accommodation for houses for all its workers and their families. This measure would prevent the setting up of new works in the heart of an already overcrowded town and the enticement of rural dwellers to flock to the town and enter the unhealthy environment associated with urban employment. If groups of industries were established along these lines small townships, limited in size, could be set up which would be sufficiently near the agricultural areas to enable workers to obtain their natural

foodstuffs cheaply and further would not estrange them entirely from their old methods of living.

It is in these gradually evolving communities that survey methods are so necessary; by tuberculin test and fluoroscopy it should be possible to watch the progress of infection and to circumscribe the more dangerous foci of disease. The establishment of a tuberculosis dispensary would be a measure of great practical value, the community has now outgrown the limited resources of the district hospital and its individual members have attained the stage where they may be expected to make intelligent use of such a centre. Along with the erection of a dispensary there arises the problem of providing a specialized medical staff. Once again we are faced with the question of the relative importance of tuberculosis compared with other diseases and the necessity for deciding whether the additional expense of the appointment of a phthisiologist is justified. In the more backward communities the best person to handle the problem is the district medical officer; he has a sound all round knowledge and if necessary should be encouraged to take study leave to make himself *au fait* with the more technical aspects of tuberculosis treatment. In communities where development is proceeding, the health officer, in co-operation with the staff of the district hospital, should be made responsible for anti-tuberculosis measures. One cannot recommend the appointment of specialist officers at this stage, the extra expense is not justifiable; further, most tropical countries have in their service men with post-graduate experience of tuberculosis work. An experienced officer of this kind could be seconded for a time to formulate a plan of campaign and to assist in dealing with special aspects of the task.

There is also the question of a subordinate staff and the problem of obtaining an efficient personnel for such a staff from among the local inhabitants. To expect to be able to produce a highly trained and certificated staff from a community slowly evolving out of a primitive state would be foolish. On the other hand to import such a staff from Europe would be beyond the means of most communities if it were to be devoted entirely to tuberculosis work. It is not necessary to demand a high standard of training for such Health Visitors, in the first place a course of training in the local hospital of sufficient duration to enable them to understand the elementary facts about the treatment and prevention of disease should be arranged. To undergo this training women should be selected who have had a reasonable degree of education, possessed of common sense and of good moral standard. The mission or religious body that cannot produce such women nowadays from amongst its adherents is rare indeed. They need not be capable of solving difficult nursing problems, but they must be able to do hard work, face rebuffs with quiet patience and show a quick sympathy and understanding and unquestioned loyalty. Given these qualities the development of such a woman, of whatever race, into a first-class social worker is a matter of time and largely dependent on the ability of the medical officers to mould her into the desired pattern.

The presence of a dispensary raises the question of hospitalization, and it should be met at this stage by granting accommodation in the general wards of the district hospital to cases fit for collapse therapy, and if possible the erection of a separate ward for advanced cases requiring isolation. The gradual introduction of artificial pneumothorax treatment would probably meet with a reasonable degree of

success, since in a community developing along normal lines there is a greater tendency for the population to become fixed and a lessened desire on the part of the individuals to bolt into the bush when they encounter something they do not understand.

The Control of Tuberculosis in Municipalities and Townships.

In an established and long urbanized community the interested medical officer need search no longer for the existence of tuberculosis, but it is more necessary for him to study the trend of the disease in relation to economic and racial factors. CROCKET (1928) emphasizes this fact when he says that despite the exposure of many successive generations and the improvement in the standard of living in the United Kingdom the incidence of the disease is no less. What has altered is the character of the malady since the rapidly progressive case is less often encountered, but much of the disease is of the concealed or latent variety. The need for careful surveys and examination of all available pathological evidence still continues and should not be neglected, if time is available, simply because routine methods of treatment have been organized along recognized lines and it is felt that there are no new fields to conquer.

In any urban area the establishment of a tuberculosis dispensary should be an accomplished fact, whether the local authorities or Government are responsible for its upkeep. The number of large towns throughout the tropics without any tuberculosis centres is surprising, especially as many are quite capable of undertaking the financial responsibility for such a project. It is more often due to fear of heavy financial commitments than to actual apathy; few realize that a dispensary can be run without any exaggerated expenditure. In urban communities where there is a responsible and well-to-do section, every effort should be made to encourage these better class people to take a share in the work by financial aid and by working on committees in connexion with the dispensary. Nor should the dispensary physician be content to work only at the dispensary: other preventive measures should be encouraged. The routine examination of schoolchildren might well include monthly weigh-ins and those who have lost weight should be examined clinically and by fluoroscopy. HETHERINGTON (1927) states that latent apical tuberculosis of adolescents causes moderate loss of weight in some but not in all cases. As a rule, however, the writer has found that the scales form a good guide, and indicate the necessity or otherwise for further examination. Another method of prevention should be the fluoroscopic examination of school teachers at regular intervals; not only will this aid detection of cases, but it also has definite value as propaganda and interests the teachers in the question of tuberculosis.

In the smaller townships, if such a one is available, a health officer who has held a resident appointment in an up-to-date sanatorium at home should be responsible for the tuberculosis work in addition to his other duties. In many of the large tropical towns the prevention of tuberculosis is rapidly becoming the most important health problem and the appointment of a full-time tuberculosis officer is no longer a luxury, but a necessity. In such areas the required standards for Health Visitors may well be raised and the posts filled by fully trained local nurses, especially those in possession of a Health Visitor's Certificate.

Nor is the simple tuberculosis village alone able to meet the demands of a sophisticated community, the provision of more orthodox institutional treatment has to be considered.

There is no doubt in the minds of most tropical workers that the results of treatment are sufficiently good to justify the provision of tuberculosis institutions. To view the question solely in the light of direct results of active treatment is a mistaken policy. The propaganda effect of modern therapeutic methods is far more important than the end results alone. Nor must we forget the public health aspect of successful treatment lessening the number of infectious cases at large. Especially is this evident in ambulatory A.P. treatment, as by these means we are enabled to deal with those who refuse any but the minimum institutional treatment. Frimodt-Möller (1926) claims that of 807 patients traced after their discharge from his sanatorium in India after five years 54·5% were still alive. Results such as these indicate that it is wrong to adopt the hopeless attitude so common in the past. If institutional treatment is to be carried out and the necessary resources are available, the erection of a hospital for all types of cases is indicated and not just a sanatorium for early cases.

Crocket (1934) advocates the establishment of a sanatorium to deal with all stages of the disease, from the hospital for its advanced cases to the labour colony for the convalescent ones. Those are exactly the lines that should be followed in the tropics. To build in one corner a lazaret for the dying and to erect on a different site a sanatorium for those who improve means that the advanced case will never seek hospitalization, unless he is absolutely forced by legal or economic requirements. But if within the same compounds we have all the necessary accommodation for each stage of the disease the sufferer will readily seek admission; even if he is assigned to the advanced wards, he sees about him those who have improved and the hope that it will not be long before he is able to cross the compound into the convalescent wards is ever present with him.

The hospital should be as near to the town as is consistent with ample accommodation and grounds, distance means transport and few natives are sufficiently well off to pay even the few cents required for their regular conveyance to and fro. This means that visits by friends and relatives are limited and furnishes an additional reason for not entering hospital. Even in tropical countries where sites are available in the hills, it appears inadvisable to make use of such sites on account of their distance, except for those able to afford the cost of transport. Suitable accommodation for those able to pay must be provided. Paneth (1934) as a result of his experiences in Java urges the necessity of establishing the principle of patients contributing whatever they can afford.

No tuberculosis hospital is going to get the best results if it can only obtain its cases when they have reached an advanced stage. The best way of obtaining cases in a reasonably early stage, apart from contact work, is by continuous propaganda. The tuberculosis officer must be prepared to speak in season and out of season; to-day in the tropics there are springing up innumerable societies for young men and women and these always welcome health talks. Propaganda amongst school teachers is one that brings the best returns, the teacher holds a very definite position amongst his or her neighbours and his advice is more often sought than may be the case in this country. Pictorial propaganda should be employed extensively, posters, magic lantern slides,

cinematograph shows have all a great appeal. One thing they require however, is local colour, as far as possible they should be prepared on the spot, those from home often fail to impress natives because they portray surroundings unfamiliar to them.

In view of the fact that early and energetic treatment is producing good results, even amongst the less resistant races, it is necessary to consider the question of after-care. CARTER (1926) who had a wide experience of tuberculosis among the negroes of the U.S.A. said that tuberculosis is curable in the negro, but that he is so prone to return to his careless habits and to enter unsuitable occupations that the mortality after leaving the sanatorium is frightfully high. FRIMODT-MÖLLER (1924) at the Union Mission Sanatorium in the Madras Presidency has set up the nucleus of a tuberculosis colony to provide a living for poorer patients who leave the sanatorium in sufficiently good health not to require further treatment, but as yet not fit to earn their living by ordinary means. A small silk farm has been established and the product enables eight patients to earn a sum of money equivalent to what they would gain in ordinary manual employment elsewhere. In order, therefore, to give patients time to be completely restored to health, every effort should be made to establish after-care centres where remunerative and useful employment may be obtained.

The use of B.C.G. has not been stressed in view of the controversy still raging. It has been employed in Mauritius, but no results are available as yet. B.C.G. has been used in the French colonies since 1925 with apparently very satisfactory results. TOULLEC (1932) furnishes results from Dakar where the mortality among vaccinated infants has fallen from 25% to 10%, whereas no appreciable decline has been noted in the unvaccinated groups.

The place of legislation in the anti-tuberculosis scheme requires careful consideration and MATTHEWS (1935) has summed it up in a sentence that every tuberculosis worker would do well to commit to memory "When a native thinks his disease can be cured or materially eased by medical aid, no law will be required to make him seek it." The usefulness of legislation has been discussed in Part II, and the writer adheres to his view that it is a useful weapon to have in reserve, but it should be employed only as a last resource.

There are still many parts of the tropics where the native denied the treatment necessary for the arrest of tuberculosis would, if he but knew them, echo in his heartfelt manner those well-known sentences of Trudeau who recounts in his autobiography something of his feelings on being told that he had pulmonary tuberculosis. "Black despair filled my heart, I think I know something of the feelings of the man at the Bar who is told he is to be hanged on a given date, for in those days pulmonary consumption was considered as absolutely fatal."

To-day much is being done to remove that feeling of hopelessness still present in less fortunate lands. BLANCHARD (1935) outlining the measures employed in French West Africa says that expansion of facilities for hospitalization and treatment is being actively pursued in all the French colonies.

Much more has yet to be accomplished; DE LANGEN and LICHTENSTEIN (1936) write "Tuberculosis must come to form the most important problem of all tropical countries before very long. It is amazing to see with what degree of apathy the increase of tuberculosis is being regarded in East Asia. Millions are being spent annually for the

eradication of leprosy, while for the fight against tuberculosis a few paltry thousands have with difficulty been raised. The mortality statistics of the Philippine Islands over the ten years ending 1930 show the relative importance of these two diseases to the community in a most striking way; out of every thousand inhabitants 54·1 died in the course of ten years from tuberculosis; 0·27 died of leprosy. The mortality from tuberculosis was, therefore, just over 200 times as high as that from leprosy; the difference in morbidity may well be left to the imagination! The time will come, and that right soon, when this ostrich like policy will have to be set aside, and the terrible scourge that is threatening the East be met face to face."

British Guiana is a small country situated right in the tropical belt, it has scanty financial resources despite its potentialities and is largely populated by a race peculiarly susceptible to tuberculosis. Yet to-day it can boast of having an active and efficient organization to deal with the menace of tuberculosis and a mortality rate from that disease (0·8 per 1,000) which many a greater and richer tropical region might well envy. What has been done there may be accomplished elsewhere.

To conclude, the words of HOEBEKE (1934) are a timely reminder of the duty the great Colonial Powers owe to their native peoples. "Nous avons combattu avec acharnement le pian, la syphilis, la trypanosomiase, la malaria, la fièvre jaune, que nous considérons comme des maladies exotiques. La tuberculose, vieille connaissance d'Europe, ne nous a pas émus. Elle a pourtant tout lieu et droit de nous émouvoir. Elle a aussi sa petite allure exotique. Il est temps de s'en préoccuper."

REFERENCES.

ADAMS, F. Genuine Works of Hippocrates. *Trans. Sydenham Soc.*, 1849. Vol. 1, p. 355. London.

ALLAN, P. See South African Institute for Medical Research.

ANDERSON, D. D. Pulmonary Tuberculosis in a Native Population. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Vol. 21, p. 463.

ANDRÉ, Z. & LABERNADIE, V. Essais de traitement de la lèpre et de la tuberculose par des injections intraveineuses d'huile de chaulmoogra. *Bull. Soc. Path. Exot.* 1933. Vol. 26, p. 1234.

ARNOULD, E. Un nouvel aspect du problème de la tuberculose chez les juifs. *La Presse Méd.* 1936. Vol. 44, p. 261.

ARONSON, J. D. Incidence of Tuberculous Infection in some Communities of the South. *Am. Jl. Hyg.* 1931. Vol. 14, p. 374.

ATKEY, O. F. R. Quoted by FREIMAN, M.

AUGUSTINE, A. E. The Transfer of Tuberculosis by Dust and other Agents. *Jl. Prev. Med.* 1929. Vol. 3, p. 121.

AYCARDO, M. M. Mortality from Tuberculosis of the Lungs in a Rural Community. *Jl. Philip. Is. Med. Assn.* 1934. Vol. 14, p. 42.

BARRETO, J. de B. La tuberculose à Rio de Janeiro. Abst. *Rev. Sud-américaine de méd. et de chir.* 1934. Vol. 5, p. 121.

BAUER, F. Syphilis et tuberculose. *Bruxelles-Méd.* 1934. Vol. 14, p. 898.

BENJAMIN, P. V. The Value of Sanocrysin Treatment in Pulmonary Tuberculosis. *Indian Med. Gaz.* 1934. Vol. 69, p. 380.

BERNY, P. Tuberculose et ankylostomiase. *Bull. Soc. Path. Exot.* 1936. Vol. 29, p. 471.

BLACKLOCK, J. W. S. Tuberculous Disease in Children. *Med. Res. Council Spec. Rep. Ser. No. 172.* 1932. London. H.M. Stationery Office.

Blanchard, M. Essai d'application des collapso- et chryso-thérapies de la tuberculose pulmonaire en milieu indigène à Dakar. *La Presse Méd.* 1935. Vol. 43, p. 1775.

——. VIIIème Congrès national de la tuberculose. *La Presse Méd.* 1935. Vol. 43, 743.

Boltanski, E. La tuberculose des noirs. *La Presse Méd.* 1935. Vol. 43, p. 709.

Borrel, A. Pneumonie et tuberculose chez les troupes noires. *Ann. de l'Inst. Past.* 1920. Vol. 34, p. 105.

Bradbury, F. C. S. Causal Factors in Tuberculosis. Nat. Assn. for Prevention of Tuberculosis. London. 1933.

Branden, F. Van den, Fornara, L. & Staub, A. Rapport sur le fonctionnement du Lazaret des tuberculeux de Léopoldville et sur l'infection tuberculeuse au Stanley-pool. *Ann. Soc. Belge Méd. Trop.* 1926. Vol. 6, p. 235.

Brock, B. L. Comparative Results of Artificial Pneumothorax in White and Negro Races. *Am. Rev. Tub.* 1933. Vol. 28, p. 767.

——. The Sanocrysin Treatment of Pulmonary Tuberculosis in White and Negro Races. *Am. Rev. Tub.* 1931. Vol. 24, p. 436.

Brown, L. & Sampson, H. L. A Tentative Working Classification to Facilitate the Treatment of Pulmonary Tuberculosis. *Am. Jl. Med. Sci.* 1935. Vol. 189, p. 325.

Bruin, M. de. Epituberculosis. *Arch. Dis. Childhood.* 1936. Vol. 11, p. 65.

Bülow, T. von. Tuberculose latente réactivée par le passage des larves d'ankylostomes à travers le parenchyme pulmonaire. *Bull. Soc. Path. Exot.* 1929. Vol. 22, p. 26.

Burrows, S. M. *In* Studies of Tuberculosis among African Natives. *Tubercle.* 1934–5. Vol. 16. Supp.

Bushnell, G. E. A Study in the Epidemiology of Tuberculosis. Wm. Wood & Co., New York. 1920.

Calmette, A. Enquête sur l'épidémiologie de la tuberculose dans les colonies françaises. *Ann. de l'Inst. Past.* 1912. Vol. 26, p. 497.

Carter, H. G. Tuberculosis among the Negroes. *Am. Rev. Tub.* 1920. Vol. 4, p. 676.

——. Deductions drawn from Eight Years of Tuberculosis Work among Negroes. *Am. Rev. Tub.* 1926. Vol. 14, p. 653.

Caycedo, V. S. La cuti-réaction de von Pirquet et les élèves des écoles publiques de Bogotá. Abst. *Rev. Sud-américaine de méd. et de chir.* 1933. Vol. 4, p. 467.

Chadwick, H. D., Markoe, R. C. L. & Thomas, J. T. Collapse Therapy of Pulmonary Tuberculosis in Negroes. *Am. Rev. Tub.* 1933. Vol. 28, p. 759.

Chavarría, A. P., Rotter, W. & Luján, M. La tuberculosis en Costa Rica. *Bol. Ofic. San. Panamericana.* 1935. Vol. 14, p. 115.

Clark, H. C. Observations in Tropical Pathology. *Am. Jl. Trop. Dis. & Prev. Med.* 1915. Vol. 3, p. 331.

Cleland, J. B. Two Cases of Tuberculosis in Australian Aborigines. *Trans. Soc. Trop. Med. & Hyg.* 1912. Vol. 5, p. 256.

Cobbett, L. The Decline of Tuberculosis and the Increase in its Mortality during the War. *Jl. Hyg.* 1930. Vol. 30, p. 79.

Cochrane, E. Course, Complications and Prognosis of Open Pulmonary Tuberculosis in Children. *Tubercle.* 1935. Vol. 16, p. 529.

——. La influencia de la raza sobre la tuberculosis. *Bol. Ofic. San. Panamericana.* 1936. Vol. 15, p. 18.

Collari, S. Rapporti tra malaria e tubercolosi dal punto di vista epidemiologico, clinico e biologico. *Riv. di Malariologia.* 1932. Vol. 11, p. 308.

——. Malaria e tubercolosi. La malarioterapia nella tubercolosi polmonare. *Lotta contro la tubere.* 1933. Vol. 4, p. 360.

Cordero, N. & Ocampo, M. Vital-Capacity Studies among Filipinos. *Philippine Jl. Sci.* 1931. Vol. 44, p. 325.

CORNELL, R. L. The Incidence of Tuberculosis among Cattle in Tanganyika Territory. *Jl. Comp. Path. & Therap.* 1934. Vol. 47, p. 320.

CRAIG, W. S. Multiple-puncture Cutaneous Tuberculin Test. *Brit. Med. Jl.* 1933. Vol. 1, p. 184.

CROCKET, J. Present-day Methods in the Treatment of Tuberculosis. *Glasgow Med. Jl.* 1926. Vol. 105, p. 420.

——. Statistical Evidence Pointing to the Possible Ultimate Eradication of Tuberculosis. *Jl. State. Med.* 1933. Vol. 41, p. 164.

——. Ultra-Violet Ray Treatment in Tuberculosis. *Tubercle.* 1926. Vol. 8, p. 1.

——. The Institutional Treatment of Tuberculosis. *Tubercle.* 1934. Vol. 15, p. 537.

——. Concealed Tuberculosis. *Glasgow Med. Jl.* 1928. Vol. 110, p. 341.

CUMMINS, S. L. Primitive Tribes and Tuberculosis. *Trans. Soc. Trop. Med. & Hyg.* 1912. Vol. 5, p. 245.

——. "Virgin Soil"—and after. *Brit. Med. Jl.* 1929. Vol. 2, p. 39.

——. Medical History of the War. Pathology. H.M. Stationery Office, London. 1923.

——. See South African Institute for Medical Research. 1932.

——. *In* Studies of Tuberculosis among African Natives.—*Tubercle.* 1934–5. Vol. 16. Supp.

—— & EVANS, A. C. The Intradermal Tuberculin Test in Non-Tuberculous Adults. *Brit. Med. Jl.* 1933. Vol. 1, p. 815.

CURASSON, G. Quoted by HORNBY, H. E.

CUTLER, J. W., RODGERS, W. H. & CIPPES, I. B. Ambulatory Artificial Pneumothorax in the Treatment of Tuberculosis in the Negro. *Am. Rev. Tub.* 1934. Vol. 30, p. 80.

DAKE, W. J. L. Wat weten wij van de tuberculose onder de inheemsche bevolking van Ned-Indië? *Geneesk. Tijdschr. v. Nederl.-Indië.* 1928. Vol. 60, p. 198.

DANIELS, C. W. (Comment on) Primitive Tribes and Tuberculosis. CUMMINS, S. L. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1912. Vol. 5, p. 245.

DAVENPORT, C. B. & STEGGERDA, M. Race Crossing in Jamaica. Washington. 1929.

DAVIES, C. The Value of Sodium Morrhuate and Sodium Linate in Tuberculosis and Leprosy. *Indian Med. Gaz.* 1921. Vol. 56, p. 283.

DE HAAS, J. H. Tuberculine-Index en (Long) Tuberculose onder Chineesche Zuigelingen en Kleuters in Batavia. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Vol. 73, p. 898.

——, KWA TJOAN SIOE & TAN KIM HONG, Tuberculine-Index van Chineesche Schoolkinderen in Batavia. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Vol. 73, p. 934.

DJAMIL, Moh. Investigation into the Occurrence of Tuberculosis in some Villages of the Padang Highlands. *Mededeel. v. d. dienst. d. volksgezondh. in Nederl-Indië.* 1929. Vol. 18, p. 221.

DONNELLY, J. Tuberculosis among Negro Children. *Am. Rev. Tub.* 1935. Vol. 31, p. 429.

DROLET, G. J. Incidence of Tuberculous Infection among Children in New York City. *Am. Rev. Tub.* 1934. Vol. 30, p. 1.

DUBOIS, A. La cuti-réaction à la tuberculine chez les lépreux. *Ann. Soc. Belge Méd. Trop.* 1932. Vol. 12, p. 1.

ELIASBERG, H. & NEULAND, W. Die Epituberkulose Infiltration der Lunge bei Tuberkulosen Sauglingen und Kindern. *Jahrb. f. Kinderh.* 1920. Vol. 93, p. 88.

EPSTEIN, B. Zur Klinik der Epituberkulose Infiltration der Rindlichen Lunge. *Jahrb. f. Kinderh.* 1922. Vol. 99, p. 59.

EVERETT, F. R. The Pathological Anatomy of Pulmonary Tuberculosis in the American Negro and in the White Race. *Am. Rev. Tub.* 1933. Vol. 27, p. 411.

FELLOWS, H. H. Significant Active Pulmonary Tuberculosis in the Apparently Healthy Adult. *Am. Jl. Med. Sci.* 1934. Vol. 188, p. 533.

FERGUSON, R. G. Tuberculosis among the Indians of the Great Canadian Plains. *Trans. Nat. Assn. Prev. Tub. 14th Ann. Conf.* 1928. p. 5.

FERGUSON, H. R. M. Tuberculosis in Native Africans. *W. African Med. Jl.* 1927. Vol. 1, p. 30.

FISHBERG, M. & SHAMASKIN, A. The Benign Course of Apical Tuberculosis. *Jl. Am. Med. Assn.* 1929. Vol. 93, p. 108.

FOSTER, J. H. & HSIEH, P. L. The Vital Capacity of the Chinese. *Arch. Int. Med.* 1923. Vol. 32, p. 335.

FREIMAN, M. Malaria and Tuberculosis. *Jl. Trop. Med. & Hyg.* 1927. Vol. 30, p. 181.

FRIMODT-MÖLLER, C. Sanatorium Treatment in India. *Tubercle.* 1926. Vol. 7, p. 313.

——. Annual Report of Union Mission. Tuberculosis Sanatorium. Madras. 1924–5.

—— & GNANAMUTHU, D. V. The Value of Phrenic-Exairesis in the Treatment of Pulmonary Tuberculosis. *Indian Med. Gaz.* 1930. Vol. 65, p. 136.

GAINES, A. R. & KELLER, P. E. Collapse Therapy of Pulmonary Tuberculosis in Negroes. *Am. Rev. Tub.* 1933. Vol. 28, p. 779.

GALLOWAY, D. J. Notes on some Local Aspects of Tuberculosis. *Malay. Med. Jl.* 1928. Vol. 3, p. 1.

GEAR, H. S. Tuberculosis in China. *Chinese Med. Jl.* 1935. Vol. 49, p. 446.

GEOGHEGAN, J. Tuberculosis from a West Indian Standpoint. *Lancet.* 1919. Vol. 2, p. 56.

GIBSON, C. B. Tuberculosis in Negro Children. *Am. Rev. Tub.* 1934. Vol. 29, p. 430.

GUILD, C. St. C. Tuberculosis among Negroes. *Jl. Am. Med. Assn.* 1933. Vol. 101, p. 2111.

—— & NELSON, M. The Problem of Coexisting Syphilis and Tuberculosis in the Light of Current Opinion and Practice. *Am. Rev. Tub.* 1936. Vol. 33. p. 31.

GOLDBERG, B. & GASUL, B. M. Epituberculosis. *Am. Jl. Med. Sci.* 1930. Vol. 180, p. 824.

GRACIEUX, P. Quoted by FREIMAN M.

GREER, A. E. The Problem of Syphilis in a Tuberculosis Clinic. *Ann. Int. Med.* 1930. Vol. 4, p. 387.

GRIEVE, R. Endemic Disease in British Guiana. *Brit. Med. Jl.* 1890. Vol. 1, p. 468.

HALFORD, F. J. Tuberculosis in the Hawaiian. *Am. Rev. Tub.* 1933. Vol. 28, p. 370.

HALL, G. N. Tuberculosis in Cattle in Northern Nigeria. *W. African Med. Jl.* 1931. Vol. 4, p. 69.

HALL, G. A. M. & CHANG, C. P. Latent Pulmonary Tuberculous Infections in Chinese Adults of the Professional Classes. *Am. Rev. Tub.* 1934. Vol. 30, p. 193.

HART, P. D'A. The Value of Tuberculin Tests in Man. *Med. Res. Council. Spec. Rep. Ser. No. 164.* 1932. London. H.M. Stationery Office.

HEIMANN, H. L. Disease in Non-European Patients. *S. African Med. Jl.* 1936. Vol. 10, p. 215.

HETHERINGTON, H. W. & FLAHIFF, E. W. Fluoroscopy in Tuberculosis Case-Finding. *Am. Rev. Tub.* 1933. Vol. 27. p. 71.

——, MCPHEDRAN, F. M., LANDIS, H. R. M. & OPIE, E. L. A Survey to Determine the Prevalence of Tuberculous Infection in School Children. *Am. Rev. Tub.* 1929. Vol. 20, p. 421.

——. Malnutrition in Childhood and Tuberculous Infection. *Am. Rev. Tub.* 1927. Vol. 16, p. 459.

Hoebeke, L. Tuberculose nègre et colonies africaines. *Bruxelles-Méd.* 1934. Vol. 14, pp. 1528, 1603, 1665.

Hodson, V. S. Pulmonary Tuberculosis in the Tropics. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1929. Vol. 23, p. 9.

Hornby, H. E. Bovine Tuberculosis in Tropical Africa. *E. African Med. Jl.* 1934. Vol. 11, p. 9.

Hrdlicka, A. Contributions to the Study of Tuberculosis in the Indian. *Trans. Sixth Internat. Congress Tuberculosis. 1908.*

Hughes, T. A. On the Nature of Pulmonary Tuberculosis in Adult Punjabis. *Indian Jl. Med. Res.* 1935. Vol. 22, p. 801.

Jaikaran, S. S. Pulmonary Consolidations in Cases of Tuberculosis. *Tubercle.* 1934. Vol. 15, p. 350.

Jameson, W. W. Medical Services at Home and Abroad. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Vol. 28, p. 215.

Jemma, R. Klinische Feststellungen ueber die Malaria der Kinder. *Arch. f. Kinderh.* 1932. Vol. 95, p. 227.

Kleine, F. K. Beobachtungen ueber Tuberkulose den Eingeborenen im Innern Ostafrikas. *Deut. Med. Woch.* 1930. Vol. 56, p. 130.

Knopf, S. A. Climate in Tuberculosis and the Prevention of Relapses. *Jl. Am. Med. Assn.* 1931. Vol. 96, p. 2023.

Kogan, L. Ambulante Pneumothoraxbehandlung bei der einseitigen Lungentuberkulose. *Ztschr. f. Tuberk.* 1930. Vol. 57, p. 173.

Koppisch, E. Tuberculosis in Puertoricans. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1936. Vol. 11, p. 492.

Krishnan, B. T. & Vareed, C. The Vital Capacity of 103 Male Medical Students in South India. *Indian Jl. Med. Res.* 1931–2. Vol. 19, p. 1165.

Krishnan, K. V. Spontaneous Tuberculosis in Laboratory Monkeys. *Indian Jl. Med. Res.* 1936. Vol. 23, p. 721.

Krumdieck, C. F. La infección tuberculosa del Niño en Lima. *Crónica Medica.* 1931. Vol. 48, p. 226.

Kyriasidis, K. N. Ueber den Einfluss der Malaria auf den Widerstand des Organismus bei Tuberkulose. *Deut. Med. Woch.* 1930. Vol. 56, p. 995.

Lambert, L. Complication méningée d'une tuberculose pulmonaire. *Bull. Soc. Path. Exot.* 1932. Vol. 25, p. 839.

Lambert, R. A. & de Castro, Jr., B. Tuberculosis in the Tropics. *Am. Rev. Tub.* 1925. Vol. 12, p. 173.

Lambrichts. Quelques aspects radiologiques de la tuberculose chez les noirs de Léopoldville. *Ann. Soc. Belge Méd. Trop.* 1933. Vol. 13, p. 149.

Landis, H. R. M. The Tuberculosis Problem and the Negro. *Trans. 22nd Ann. Nat. Tub. Assn.* 1926. p. 377.

Landsberger, M. Statistiche Untersuchungen ueber den Einfluss der Tuberkulose auf die Lues. *Virchow's Arch. Path. Anat.* 1923. Vol. 241, p. 392.

de Langen, C. D. & Lichtenstein, A. A Clinical Text-Book of Tropical Medicine. Batavia. 1936.

Lankester, A. Tuberculosis in India, its Prevalence, Cause and Prevention. 1920.

Lasnet. Notes concernant l'état sanitaire de l'armée du Rhin. *Ann. Méd. Pharm. Colon.* 1922. Vol. 20, p. 273.

Laurence. L'invasion primitive tuberculeuse chez le tirailleur sénégalais. *Ann. Méd. Pharm. Colon.* 1932. Vol. 30, p. 516.

Ledentu, G. Notes sur la tuberculose au Cameroun. *Bull. Soc. Path. Exot.* 1934. Vol. 27, p. 308.

Legendre, J. La tuberculose dans nos colonies. *Bull. Soc. Path. Exot.* 1922, Vol. 15, p. 51.

Leo, T. L. & Chang, C. Phrenicectomy in the Treatment of Pulmonary Tuberculosis. *Chinese Med. Jl.* 1934. Vol. 48, p. 457.

Liston, W. G. & Soparkar, M. B. The Susceptibility of Indian Milch Cattle to Tuberculosis. *Indian Jl. Med. Res.* 1917, Vol. 5, p. 19.

Long, E. R., Seibert, F. B. & Aronson, J. D. A Standardised Tuberculin (Purified Protein Derivative) for Uniformity in Diagnosis and Epidemiology. *Tubercle.* 1935. Vol. 16, p. 304.

——. The Pathogenesis of Chronic Ulcerative Pulmonary Tuberculosis. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1934. Vol. 9, p. 365.

——. Modern Measures in Mass Control of Tuberculosis. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1935. Vol. 10, p. 417.

Machado, G. H. & Baldó, J. I. Caracas. *Bol. Ofic. Sanit. Panamericana.* 1934. Vol. 13, p. 1137.

Mandoul, A. H. A propos de l'action de quelques helminthes sur l'évolution de la tuberculose. *Ann. de Parasitol.* 1931. Vol. 9, p. 323.

Manley, F. H. A Note on Bovine Tuberculosis in Tropical Africa. *Jl. Comp. Path. & Therap.* 1929. Vol. 42, p. 276.

Mason, Eleanor O. Normal Vital Capacity of the Lungs in South Indian Women. *Indian Jl. Med. Res.* 1932–33. Vol. 20, p. 117.

Matthews, R. J. *In* Studies of Tuberculosis among African Natives. *Tubercle.* 1934–5. Vol. 16. Supp.

Mathis, C. & Durieux, C. Considérations sur la tuberculose en Afrique Occidentale française. *Bull. Soc. Path. Exot.* 1930. Vol. 23, p. 533.

Matz, P. B. The End-Results of the Surgical Treatment of Pulmonary Tuberculosis. *Am. Rev. Tub.* 1936. Vol. 33, p. 533.

McKinley, E. B. A Geography of Disease. Washington. 1935.

McPhedran, F. M. & Opie, E. L. Clinical Significance of Latent Pulmonary Tuberculosis. *Arch. Int. Med.* 1933. Vol. 52, p. 137.

Mills, C. A. Susceptibility to Tuberculosis: Race or Energy Level? *Am. Jl. Med. Sci.* 1935. Vol. 189, p. 330.

Minett, E. P. Tuberculosis in Hong Kong. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1930. Vol. 24, p. 337.

Montel, M. L. R. Études de pathologie annamite en Cochinchine. *Bull. Soc. Path. Exot.* 1924. Vol. 17, p. 434.

Moon, V. H. Racial Variation in Size of Spleen. *Arch. Path.* 1928. Vol. 5, p. 1040.

Morlock, H. V. & Pinchin, A. J. S. Epituberculosis. *Lancet.* 1933. Vol. 1, p. 1114.

Myers, J. A. & Levine, I. Artificial Pneumothorax in Treatment of Progressive Minimal Pulmonary Tuberculosis. *Am. Rev. Tub.* 1935. Vol. 31, p. 518.

O'Brien, R. A. Report on the Examination of Samples of Veterinary Tuberculin. p. 65. *Med. Res. Council Spec. Rep. Ser. No. 94.* Tuberculin Tests in Cattle. 1925. London. H.M. Stationery Office.

Opie, E. L. Anatomical Characteristics of Tuberculosis in Jamaica. *Am. Rev. Tub.* 1930. Vol. 22, p. 613.

—— & Isaacs, E. J. Tuberculosis in Jamaica. *Am. Jl. Hyg.* 1930. Vol. 12, p. 1.

——. Active and Latent Tuberculosis in the Negro Race. *Am. Rev. Tub.* 1924. Vol. 10, p. 265.

O'Shaughnessy, L. Phrenicectomy in the Treatment of Pulmonary Disease. *Lancet.* 1932. Vol. 2, p. 767.

Otero, P. M., Koppisch, E. & Axtmayer, J. H. Influence of Dietary Factors upon the Resistance of the White Rat to Experimental Tuberculosis. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1934, Vol. 9, p. 314.

Padget, P. & Moore, J. E. The Interrelationships of Tuberculosis, Syphilis and Antisyphilitic Treatment. *Am. Rev. Tub.* 1936. Vol. 33, p. 10.

Pai, M. K. The Result of Artificial Pneumothorax Treatment in Pulmonary Tuberculosis. *Indian Med. Gaz.* 1927. Vol. 62, p. 69.

—— & Venugopal, C. A. The Diagnostic Value of the Cutaneous Tuberculin Test in Tuberculous Infection in India. *Tubercle.* 1926. Vol. 7, p. 521.

PALMER, T. M., LAFFITTE, L. S. & WHITE, J. A., Jr. Tuberculin-Testing with P. P. D. and O. T. *Am. Rev. Tub.* 1936. Vol. 33, p. 259.

PANETH, O. Tuberculose in de Karolanden. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1928. Vol. 68, p. 473.

——. Over de chirurgische Behandeling van longtuberculose. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. Vol. 72, p. 514.

——. Bijdrage tot de Sanatorium-Behandeling van Longtuberculose in Nederlandsch-Indië. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Vol. 74, p. 601.

PARSONS, L. G. The Childhood Type of Tuberculosis. *Lancet.* 1934. Vol. 1, p. 1101.

PASTOR, J. R. Epidemiology of Tuberculosis in Porto Rico. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1929. Vol. 4, p. 431.

—— & CESTERO, G. R. Forms of Pulmonary Tuberculosis in Puerto Rico. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1936. Vol. 11, p. 479.

——, OTERO, P. M. & PAYNE, G. C. Tuberculosis Surveys in Puerto Rico. *Puerto Rico Jl. Pub. Health & Trop. Med.* 1935. Vol. 10, p. 451.

PAWAN, J. L. The Type of Tubercle Bacillus in Human Sputa in Cases of Pulmonary Tuberculosis in Trinidad. *Ann. Trop. Med. & Parasit.* 1927. Vol. 21, p. 1.

PINNER, M. & KASPER, J. A. Pathological Peculiarities of Tuberculosis in the American Negro. *Am. Rev. Tub.* 1932. Vol. 26, p. 463.

POTTER, N. B. Salvarsan in the Treatment of Double Infections, Tuberculosis and Syphilis. *Am. Jl. Med. Sci.* 1916. Vol. 152, p. 823.

POWELL, A. Some Observations on Tuberculosis in India. *Proc. Roy. Soc. Med.* (Sect. Trop. Dis. & Parasit.). 1922. Vol. 15, p. 56.

PRINGLE, A. D. Pulmonary Tuberculosis in South Africa. *Jl. Med. Assn. S. Africa.* 1930. Vol. 4, p. 453.

PROSOROFF, A. E. Ueber sogenannte "epituberkulose Infiltrate" des Lungengewebes. *Beitr. z. Klin. d. Tuberk.* 1929. Vol. 72, p. 566.

PURCHASE, H. S. The Incidence of Tuberculosis in a Herd in Northern Rhodesia. *Jl. Comp. Path & Therap.* 1929. Vol. 42, p. 135.

PUTNAM, P. The Bionomics of Families attending a Tuberculosis Dispensary. *Am. Rev. Tub.* 1933. Vol. 28, p. 591.

RABELLO, E. A tuberculose cutanea; sua incidencia em algumas regiões da America do Sul. *Brasil Med.* 1932. Vol. 46, p. 1.

REICHLE, H. S. Resolving Exudates in Pulmonary Tuberculosis of Childhood. *Am. Jl. Dis. Child.* 1933. Vol. 45, p. 307.

RODHAIN, J. Les infections tuberculeuses au Congo belge. *Ann. Soc. Belge Méd. Trop.* 1928. Vol. 8, p. 101.

ROGERS, L. Tuberculosis Incidence and Climate in India. *Brit. Med. Jl.* 1925. Vol. 1, p. 256.

——. Pneumonia Incidence and Climate in India. *Lancet.* 1925. Vol. 1, p. 1173.

ROUBIER, Ch. Les formes cliniques de la tuberculose thoracique chez les troupes exotiques importées en France pendant la guerre. *Gaz. des. Hop.* 1920. Vol. 93, p. 1333.

RAY, K. S. *et al.* Solganal-B Treatment of Pulmonary Tuberculosis in the Jadabpur Tuberculosis Hospital. *Jl. Indian Med. Assn.* 1933. Vol. 3, p. 115.

SCHLESINGER, H. Syphilis und innere Medizin. Teil II. Vienna. Julius Springer. 1926.

SCHÜTZE, H. & ZILVA, S. S. Diet and Tuberculosis. *Jl. Hyg.* 1927. Vol. 26, p. 204.

SCOTT, H. H. Tuberculosis in Man in the Tropics. *Proc. Roy. Soc. Med.* 1935. Vol. 28, p. 1343.

——. Tuberculosis in Man and Lower Animals. *Med. Res. Council Spec. Rep. Ser. No. 149.* 1930. London. H.M. Stationery Office.

——. The Prevalence and Character of Tuberculosis in Hong Kong. *Ann. Trop. Med. & Parasit.* 1921. Vol. 15, pp. 213, 227.

Selwyn-Clarke, P. S. *Ann. Rep. Med. Dept. Gold. Coast Colony.* 1935.

Shrikhande, Y. G. Oleothorax. *Indian Med. Gaz.* 1934. Vol. 69, p. 384.

Sitsen, A. E. The Anatomical Aspect of Tuberculosis in Java. *Mededeel. v. d. dienst. d. volksgezondh. in Nederl.-Indië.* 1928. Vol. 17, p. 33.

Smith, E. C. Facial Tuberculosis in Nigeria. *Jl. Trop. Med. & Hyg.* 1930. Vol. 33, p. 133.

Smith, M. I. with Hendrick, E. C. Studies on Nutrition in Tuberculosis. *Jl. Lab. & Clin. Med.* 1925–6. Vol. 11, p. 712.

Snyder, L. H. "Blood Groups of the Jamaicans." Race Crossing in Jamaica. Washington. 1929.

Soparkar, M. B. A Case of Bovine Tubercle Bacillus Infection in Man in India. *Indian Jl. Med. Res.* 1929. Vol. 17, p. 574.

Soper, W. B. & Wilson, J. L. The Detection of Pulmonary Tuberculosis in 3,000 Students entering Yale University. *Am. Rev. Tub.* 1932. Vol. 26, p. 548.

Sorour, M-F., quoted by Mandoul.

South African Institute for Medical Research. Tuberculosis in South African Natives with special reference to the Disease amongst the Mine Labourers on the Witwatersrand. Johannesburg. 1932.

Spence, J. C. Benign Tuberculous Infiltration of the Lung (Epituberculosis). *Arch. Dis. Childhood.* 1932. Vol. 7, p. 1.

Stones, R. Y. Tuberculosis in Natives of Uganda. *Kenya & E. African Med. Jl.* 1928. Vol. 5, p. 61.

——. A Scheme for Reducing the Incidence of Tuberculosis in Uganda. *E. African Med. Jl.* 1932. Vol. 9, p. 355.

Toullec, F. La tuberculose des Sénégalais. *Ann. Méd. Pharm. Colon.* 1931. Vol. 29, p. 635.

—— & Jolly. Note sur la tuberculose en Côte d'Ivoire. *Bull. Soc. Path. Exot.* 1932. Vol. 25, p. 679.

Toullec, M. La tuberculose aux colonies. Les grandes endémies tropicales. Paris. 1932.

Tournier, E. La tuberculose du noir au Togo. *Bull. Soc. Path. Exot.* 1934. Vol. 27, p. 225.

Trudeau, E. L. An Autobiography. pg. 71. Doubleday, Doran & Co., Inc. New York. 1928.

Turner, G. A. See South African Institute for Medical Research.

Uganda Medical Department. Annual Report. 1935.

Ukil, A. C. Epidemiology and Pathology of Tuberculosis in India. *Indian Jl. Med. Res.* 1929. Vol. 17, p. 821.

Van Goor, W. Th. De Behandeling van Longtuberculose met eenzijdige Verslamming van het Middlerif. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. Vol. 72, p. 658.

Van Hoof, L., Clevers, M. & Donadio, F. Enquête sur la tuberculose humaine à Stanleyville. *Ann. Soc. Belge Méd. Trop.* 1926. Vol. 6, p. 183.

Vassal, J. J. The Occurrence of Tuberculosis among Primitive Peoples, principally in the French Colonies. *Trans. Nat. Assn. Prev. Tub. 14th Ann. Conf.* 1928. p. 57.

Vint, F. W. One Year's Post Mortem Work on Natives of East Africa. *Kenya & E. African Med. Jl.* 1928–9. Vol. 5, p. 383.

Walsh, G. & Mason, H. M. Pulmonary Tuberculosis in the American Negro. *Am. Rev. Tub.* 1935. Vol. 31, p. 413.

Weber, G. W., Murphy, K. M. & Holcomb, F. W. Intracutaneous Tuberculin Test and Use of Fluoroscope in a County Survey. *Am. Rev. Tub.* 1935. Vol. 32, p. 331.

Wieberdink, Tj. On Surgical Tuberculosis and Sporotrichosis among Natives. *Mededeel. v. d. dienst d. volksgezondh. in Nederl.-Indië.* 1920. Vol. 2, p. 29.

Wilcocks, C. Notes on Tuberculosis in Dar-es-Salaam. *Kenya & E. African Med. Jl.* 1928. Vol. 5, p. 200.

——. The Problem of Tuberculosis in East Africa. *E. African Med. Jl.* 1932. Vol. 9, p. 88.

——. *In* Studies of Tuberculosis among African Natives. *Tubercle.* 1934–5. Vol. 16. Supp.

Wilson, C. J. Tuberculosis in Natives of Kenya. *E. African Med. Jl.* 1928. Vol. 4, p. 296.

Winchester, J. W. Observations on the Mortality from Tuberculosis in the Straits Settlements. *Malay. Med. Jl.* 1934. Vol. 9, p. 182.

Wisse, J. G. Oleo-Thorax. *Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Vol. 74, p. 16.

Wolf, J. E. La phrénicectomie dans le traitement des cavernes tuberculeuses à la localisation apicale. *Ann. d. Méd.* 1928. Vol. 24, p. 306.

Young, J. A. Tuberculosis and the Development of the African Native. *W. African Med. Jl.* 1934. Vol. 7, p. 128.

Ziemann, H. Zur Pathogenese, Diagnose und Prophylaxe der Tuberculose in den Tropen. *Cent. f. Bakt.* I. Abt. Orig. 1913. Vol. 70, p. 118.

BLACKWATER FEVER.

Foy (Henry) & Kondi (Athena). **Blackwater Fever in Macedonia.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 123–138. With 6 figs.

During 5 years work in Greece some 450 cases of blackwater fever have been seen and investigated in the laboratory, and some 900 made available for statistical analysis. In this paper the authors have outlined a brief general summary of their findings.

A full statistical analysis is now in the course of preparation and will be published later. The following summary is given :—

" (1) A brief outline is given of some epidemiological findings regarding blackwater fever in Macedonia, a full report of which will be published later.

" (2) Large numbers of cases of blackwater fever occur in Greece, probably not unrelated to the immigration of refugees from areas in Asia Minor where malaria was either absent or of negligible importance.

" (3) Regression equations were calculated to define any relationship that existed between malaria and blackwater fever in M_0, M_1 and M_2 years, with the result that a definite correlation was found to exist between the number of malaria cases in any year and the number of blackwater fever cases in the same year, *in an already sensitized population.*

" (4) No correlation was established between the number of blackwater fever cases and the malaria cases occurring either 1 year or 2 years previously.

" (5) No correlation existed between malaria and blackwater fever in an *unsensitized* population, no matter how severe the malaria.

" (6) The susceptibility of the populations of Macedonia to blackwater fever has been steadily rising during the last 14 years, although somewhat irregularly. Susceptibility as measured by the ratio $\frac{B}{M}$ may in future tend to oscillate about an upper limiting value, instead of increasing irregularly as it has done in the past.

" (7) The seasonal lag between the malaria and blackwater fever peaks is established ; and the correlation found to be 0·93 when the blackwater fever peak is shifted forward two months.

" (8) Blackwater fever appears to occur in a period that lies between an apparent malaria cure and relapse, as indicated by the seasonal distribution of malaria and blackwater fever, and the malaria relapse season in Macedonia.

" (9) 40 per cent. of the cases of blackwater fever were found to be positive for malaria ; 47 per cent. *falciparum*, 33 per cent. *vivax*, 14 per cent. mixed *falciparum* and *vivax*, 6 per cent. pigmented. This should not be taken to imply that *falciparum* is a ' more potent producer ' of blackwater fever than *vivax*, since *falciparum* is about 1½ times more prevalent among the general population of Macedonia than is *vivax*. But parasite rates in blackwater fever should not be taken to have any great significance unless the following are known :—

" (i) Time and amount of quinine taken prior to first passage of blackwater.

" (ii) Magnitude and duration of the haemolytic process as measured by red blood cell counts, and bilirubin levels.

" (iii) Time elapsed between first passage of black urine and taking blood film.

" (10) Charts and tables are given showing age distribution, sex ratio, death rates, family incidence, frequency of attack, etc."

W. Yorke.

Foy (Henry) & Kondi (Athena). **Researches on Blackwater Fever in Greece. IV.—Experimental Investigations into the Existence of Haemolytic Strains of Malaria and/or Other Specific Parasites in Blackwater Fever.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 423–433.

This work was undertaken with the object of examining the question whether there existed haemolytic strains of malaria or other specific parasites associated with the genesis of blackwater fever.

The experiments consisted in a series of blood inoculations into general paralytics and other mental patients, and in feeding on them mosquitoes infected from blackwater fever cases.

The inoculation of malaria-positive and negative blood, withdrawn at various periods after the first passage of haemoglobinuria from 58 cases of blackwater fever into 106 mental patients, failed in every case to produce haemoglobinuria. Similarly, anophelines of the species *elutus*, *superpictus* and *maculipennis*, infected from 35 cases of blackwater fever, and subsequently fed on 68 cases of general paralysis, failed to produce blackwater fever. It is noted that all the cases were kept under observation for from 9 to 18 months after their blood inoculation or mosquito infection.

The authors state that this work would seem to limit the field of argument for the existence of haemolytic strains of malaria or other specific parasites concerned in the genesis of blackwater fever.

W. Y.

Foy (Henry) & Kondi (Athena). **Three Cases of Blackwater Fever following the Oral Administration of Atebrin.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 99–102.

The authors encountered three cases in which blackwater fever supervened either during or after treatment of malaria with normal standard doses of atebrin. None of these had taken quinine up to within 2 to 9 months before the onset of their haemoglobinuria, so that quinine can be excluded as having taken part in the precipitation of the attack of blackwater.

Details of these cases are given. In two of them the onset of blackwater fever occurred on the 1st and 3rd days after a full course of atebrin (1·5 gm. spread over 5 days); in the third case haemoglobinuria appeared in a boy of 5 years on the 4th day of treatment, after he had received 0·7 gm. of atebrin.

It is interesting to note that in Cases 2 and 3 the haemoglobinuria occurred at a time the blood was devoid of parasites, as was shown by examinations of thick films of peripheral blood and by spleen puncture. These observations throw doubt on the hypothesis that the onset of blackwater is associated with the sudden destruction of large numbers of parasites (Manson-Bahr, 1924; and Blacklock & Macdonald, 1928) and to support the view expressed by the reviewer and his colleagues (1930).

The authors state that these observations indicate that atebrin, like quinine and plasmoquine, is capable of precipitating blackwater in certain patients, but whether these drugs are all equally potent in this respect remains to be determined. [To the reviewer's mind it seems highly probable that any drug of value in the treatment of malaria

may be liable to precipitate an attack of blackwater, and that the reason why quinine is notorious in this respect is that this drug is employed on an immensely greater scale than any other compound.]

W. Y.

Alexandrides (Karl). Ueber die Ätiologie und Pathogenese des Schwarzwasserfiebers. [**The Aetiology and Pathogenesis of Blackwater Fever.**]—*Arch. f. Schiffs- u. Trop. Hyg.* 1937. July. Vol. 41. No. 7. pp. 505-512. [48 refs.]

After defining blackwater fever the author points out that haemoglobinuria is only one sign of the disease. Haemoglobinuria can, of course, be produced by many causes, some of which are exogenous and some endogenous. Amongst the former are animal poisons (snake venom), vegetable poisons (fabism), various chemical substances, and various infective conditions; among the latter are burns, frost bite, march haemoglobinuria, and pregnancy.

Three chief theories have been advanced to explain the aetiology of blackwater fever—(1) that it is due to quinine; (2) that it is due to a special form of malaria; and (3) that it is a special disease. Each of these theories is discussed in turn. The first is dismissed because blackwater fever occurred in the time of Hippocrates, long before quinine was known, and because blackwater fever has followed the administration to malaria cases of many drugs and notably in recent times of atebrin and plasmoquin. [This line of argument does not seem to the reviewer to be very sound.]

The second theory is likewise dismissed for various reasons, amongst which are the observations of Foy and Kondi on the inoculation of blackwater fever blood into general paralytics [*vide* above]. The third theory, according to which blackwater fever is a disease *sui generis*, met with, however, only in persons who have suffered from malaria, seems to the author to be the most probable. Possibly the unknown factor is a special spirochaete, the malaria preparing the ground for this infection by bringing about a dysfunction of the reticulo-endothelial system. [This paper does not carry us much further.] *W. Y.*

Werner (H.). Ueber Schwarzwasserfieber und seine Ueberwindung durch Chininvermeidung. Ersatz durch Plasmochin und Atebrin und ueber das Anurieproblem. [**Blackwater Fever and its Surmounting by the Avoidance of Quinine. Substitution by Plasmoquine and Atebrin, and on the Anuria Problem.**]—*Deut. Med. Woch.* 1937. Feb. 12. Vol. 63. No. 7. pp. 270–271.

A semi-popular article which contains nothing new. The author stresses the importance of blackwater fever as a cause of death among the white population in malaria regions. The rôle which quinine plays in the production of blackwater fever is so well-known and so scientifically proved, and it is so equally certain that pure plasmoquine and atebrin do not belong to the group of drugs which produce blackwater, that one can lay down.—"Do not treat malaria with quinine and you will certainly avoid blackwater fever." [This *ex cathedra* statement, like the title of the paper, reminds one of advertisements for patent medicines. Does the author imagine that the case for these remarkable drugs is strengthened by such grotesque hyperbole?]

W. Y.

Condoyannis (N. D.). Ueber die Ätiologie des Schwarzwasserfiebers. [**The Aetiology of Blackwater Fever.**]—*Deut. Med. Woch.* 1937. Aug. 6. Vol. 63. No. 32. pp. 1219–1221.

This article is of a speculative nature ; it contains nothing new and must be read in the original by those interested. *W. Y.*

de Hartogh (L. F. S.). Diagnostische en klinische bijzonderheden bij febris biliosa haemoglobinurica.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. July 6. Vol. 77. No. 27. pp. 1622–1634. With 3 charts. English summary.

Min Sein. **A Case of Haemoglobinuria caused by Plasmochin taken as a Prophylactic against Malaria.**—*Indian Med. Gaz.* 1937. Feb. Vol. 72. No. 2. pp. 86–87.

Details are given of a patient who developed haemoglobinuria whilst taking plasmoquine daily as a prophylactic against malaria.

The patient was one of a party of men engaged on a flag march in the jungle in Tharrawaddy district in Lower Burma, between the 31st October and 5th November, 1932. Each man was given 0·04 gm. of plasmoquine daily as a prophylactic. At the end of the fourth day's march (3rd November) the patient reported sick, and on the 5th November he was admitted to hospital. There was no previous history of malaria, the spleen was not enlarged, the blood was negative, the pulse was weak and thready, the evening temperature was 100°F., and there was general abdominal discomfort without nausea or vomiting. On admission to hospital the patient was found to be remarkably jaundiced and in a state of collapse with cold and cyanosed extremities. On questioning, it was elicited that he had passed dark-coloured urine since the 3rd November. The condition gradually improved and the patient was discharged as cured on the 30th November.

The author states there seems to be no record in the literature of haemoglobinuria following the administration of plasmoquine as a prophylactic. *W. Y.*

Attlee (W. H. W.). **Haemoglobinuria following Exertion.**—*Lancet.* 1937. June 12. p. 1400.

This paper contains notes of two cases of haemoglobinuria in public school boys, who were in the habit of playing strenuous school games and running long distances on grass, without symptoms, but attacks followed immediately after running on hard roads. Details of each case are given.

The author states that it seems unlikely that this curious sequence of events can be nothing more than a coincidence, but it is difficult to see the connexion. Neither patient had marked lordosis, and there seems no reason to think that running on roads should induce a more lordotic posture than running on grass. It is not known whether the pigment was blood haemoglobin or muscle haemoglobin, and neither patient had any symptoms other than haemoglobinuria.

W. Y.

Brulé (M.), Hillemand (P.) & Gaube (R.). Deux cas d'hémoglobinurie paroxystique. Les difficultés du diagnostic clinique et hématologique. [**Two Cases of Paroxysmal Haemoglobinuria.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1937. Feb. 22. 53rd Year. 3rd Ser. No. 6. pp. 197-205. [10 refs.]

Two cases of paroxysmal haemoglobinuria are described in considerable detail: this is justified on the ground of the difficulty in making a clinical diagnosis. On the first two occasions on which the first case was seen the patient exhibited signs of jaundice which did not present the usual features of haemolytic jaundice. The patient was taken into hospital and a laparotomy performed, but no indication of biliary obstruction was found: it was only later, when a careful examination of the blood was made that a positive Donath and Landsteiner's reaction disclosed the correct diagnosis. The second case had been under medical observation since 1925 for a haematuric nephritis associated with antecedent malaria; in this case also a positive Donath and Landsteiner's reaction revealed the true nature of the case.

W. Y.

Piéri (J.), Sardou & Battesti. Hémoglobinurie paroxystique. [**Paroxysmal Haemoglobinuria.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 154–158.

An account is given of a case of Raynaud's disease with paroxysmal haemoglobinuria. There was no history of syphilis, and the Wassermann reaction was negative; similarly, there was no history of malaria, the blood was negative, as also was Henry's reaction. The note contains nothing of special interest. *W. Y.*

Fairley (N. Hamilton). **A New Blood Pigment: Pseudo-Methaemoglobin.** [Correspondence.]—*Nature.* 1937. Apr. 3. Vol. 139. No. 3518. p. 588.

—— & Bromfield (R. J.). **Pseudo-Methaemoglobin in Blackwater Fever and its Clinical Significance.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 139–170. With 1 chart. [22 refs.]

In addition to oxyhaemoglobin, methaemoglobin has been recorded in the plasma of blackwater fever patients by Arkwright and Lepper (1918), Yorke, Murgatroyd and Owen (1930), Ross (1932), and Fairley and Bromfield (1934). [As a matter of fact, both these pigments had been observed in the plasma of blackwater fever patients by Barratt and Yorke as long ago as 1909.]

In 1934 Fairley and Bromfield recorded a new pigment closely allied to methaemoglobin in a patient desperately ill with blackwater fever [this *Bulletin*, 1935, Vol. 32, p. 210]. About a year later, the same pigment, which is now called pseudo-methaemoglobin, was again encountered.

The present paper discusses the authors' findings in Macedonia during November and December, 1936. The following summary of their observations is given:—

"1. A new pigment which we have named 'pseudo-methaemoglobin' has been constantly demonstrated in the plasma of severe cases of blackwater fever. In the past, this pigment has been erroneously regarded as methaemoglobin by all observers.

" 2. Certain spectroscopical and chemical reactions suitable for the routine differentiations of pseudo-methaemoglobin, methaemoglobin and sulphaemoglobin are described.

" 3. Pseudo-methaemoglobin produces a brown plasma, is never found within the corpuscles and is formed from oxyhaemoglobin only after its liberation from the red cells. It cannot function as a respiratory pigment.

" 4. The new pigment never appears in the urine in demonstrable quantities, nor is it destroyed by incubation at 37°C. with sterile urine for 24 hours.

" 5. Methaemoglobinuria is common in blackwater fever, but the methaemoglobin is derived from oxyhaemoglobin in the tubules or bladder and not as a result of methaemoglobinaemia.

" 6. The formation of pseudo-methaemoglobin evidently constitutes a stage in a process by which the body disposes of circulating extra-corpuscular blood pigment; in consequence the appearance of pseudo-methaemoglobin is to be anticipated in any intravascular haemolysis of sufficient magnitude.

" 7. The conversion of free oxyhaemoglobin into pseudo-methaemoglobin or any product impermeable to the kidneys is entirely beneficial since the amount of haemoglobin available for excretion in the urine is decreased and the tendency to renal damage lessened.

" 8. Pseudo-methaemoglobin can be artificially produced by incubating a concentrated solution of oxyhaemoglobin at 37° to 50°C. for 24 to 48 hours in the presence of a sufficient quantity of sterile plasma.

" 9. Similarly, when an artificially produced solution of methaemoglobin or sulphaemoglobin is incubated with sterile plasma at 40°C. for 24 to 28 hours pseudo-methaemoglobin is produced.

" 10. Pseudo-methaemoglobin may also be produced *in vitro* by some constituent in the plasma reacting with alkaline solutions of pure haemin or haematin.

" 11. Since globin is presumably absent from both these substances as well as from plasma, the suggestion is made that pseudo-methaemoglobin is formed by a combination of haeme or haematin with some nitrogenous constituent of the plasma other than globin.

" 12. When pseudo-methaemoglobin is reduced by sodium hydrosulphite a haemochromogen is formed which differs spectroscopically from globin-haemochromogen."

An appendix contains case histories of the Macedonian cases.

This interesting and important Address was followed by a discussion in which a considerable number of members took part. *W. Y.*

Cain (André), Cattan (Roger), Harrispe (Jean-Vincent) & van der Boijen (Gérard Bouwens). Anémie hémolytique ictérigène avec hémoglobinurie nocturne et hémosidérinurie permanente. [**Haemolytic Anaemia and Icterus with Nocturnal Haemoglobinuria and Permanent Haemosiderinuria.**]—*Bull. et. Mém. Soc. Méd. Hôpit. de Paris.* 1937. Feb. 1. 52nd Year. 3rd. Ser. No. 3. pp. 70–84. [17 refs.]

In 1908, Chauffard and Troisier reported a case of haemolytic icterus with haemoglobinuria continuing in a paroxysmal manner: the anaemia was extreme, the fragility of the red cells slight, and there were numerous reticulocytes. Somewhat similar cases were subsequently reported by van den Bergh, Marchiafava, Rosenthal, Hamburger and Bernstein, and others. In all, 24 such cases have now been recorded. The present authors give in great detail an account of a 25th case.

The patient was a woman of 37 years of age, who had suffered for seven years from an intense anaemia with haemolytic icterus,

associated with slight nocturnal haemoglobinuria and continuous loss of iron in the urine. The syndrome was not influenced by hepatotherapy or splenectomy; blood transfusion and the administration of iron were harmful rather than beneficial. The authors draw attention to the principal features of this interesting case:—

1. *The anaemia syndrome*—The anaemia was intense and chronic. During the period the patient was under observation (since January, 1934) the red cell count had never exceeded 2,360,000, and on one occasion had actually fallen to 590,000. It was a hyperchromic anaemia, the value ranging between 1 and 1·72, with an average of 1·3. It was also megalocytic, the red cells varying in diameter from 11 to 15μ, and there was polychromatophilia, anisocytosis, and sometimes Jolly bodies were present. Megaloblasts were never found, but normoblasts were seen in varying numbers. The leucocyte count varied from 4,000 to 1,000, and there was an excess of mononuclears. There was no glossitis, the gastric juice was normal, and there were no nervous symptoms. Prolonged hepatotherapy was useless and the only result appeared to have been a marked eosinophilia. This fact, in association with the permanent reticulocytosis, seemed to prove that the bone marrow was capable of responding.

2. *Icterus.*—This varied greatly in intensity from time to time. The urine always contained urobilin, but bile pigments were never found. This syndrome of haemolytic jaundice was completed clinically by splenomegaly.

3. *Haemoglobinuria.*—This constituted the third major symptom of the disease. From the beginning it was noticed that after each transfusion there was a pronounced haemoglobinuric crisis. This had been noted by MARCHIAFAVA and the earlier writers in their cases. Similar haemoglobinuric attacks were observed after the administration of protoxalate of iron, but exposure to cold had no effect, and the Donath-Landsteiner reaction was negative. The haemoglobinuria was accompanied by a haemoglobinaemia. Apart from these haemoglobinuric crises, traces of haemoglobin were constantly present in the urine passed during the night.

4. *Haemosiderinuria.*—This sign, which had been noted by MARCHIAFAVA, was constantly observed in the present case.

5. *The prolonged course* of the disease is worthy of note. In spite of the extreme anaemia the patient still remained capable of a certain degree of activity; she only attended hospital as an out-patient and managed to do light work. All previous authors have drawn attention to this fact, and in general the patients have died from some intercurrent trouble or as the result of splenectomy.

The paper ends with a theoretical discussion regarding the pathology of the disease and its mechanism; apparently little or nothing is known about it. *W. Y.*

THE TYPHUS GROUP OF FEVERS.

ZINSSER (Hans). **The Rickettsia Diseases. Varieties, Epidemiology and Geographical Distribution.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 430–463. With 4 figs. (maps). [140 refs.]

A very able review of the whole subject of the Rickettsia diseases of man; with a full bibliography.

The diseases are divided into three main groups: (1) spotted fever group; (2) tsutsugamushi fever group; (3) typhus fever group. Each group and the various members of the groups are discussed and are displayed in tabular form and the geographical distributions are clearly shown in a series of maps. The Weil-Felix reaction is discussed and vaccination so far as it has been worked out. *D. Harvey.*

DYER (R. E.). **Diseases of the Typhus Group in North America.**—*Canadian Public Health Jl.* 1937. Jan. Vol. 28. No. 1. pp. 1–9. With 5 figs.

This paper is a study of endemic typhus and Rocky Mountain fever, and was read at the meeting of the laboratory section of the Canadian Public Health Association on December 22nd, 1936, in Toronto.

The main points emphasized were that there had been a marked increase in the number of cases of endemic typhus in the Southern States; in 1923 there were 50 cases and in 1933, 1,922. Originally most of the cases had occurred in the coastal towns, but had later spread to rural areas. It is suggested that this spread may be due to infection of other rodents than rats, such as squirrels, rabbits, etc.

Rocky Mountain fever has been known to occur in the Rockies for more than 50 years, but during the last 10 years has been met with over the entire country except the States of Michigan and Wisconsin. It has also been reported in Canada and in Brazil. *D. H.*

DIAS (Emmanuel) & MARTINS (Amilcar Vianna). Aspectos do typho exanthematico em Minas Geraes. [**Typhus Fever in Minas Geraes.**]—*Brasil-Medico.* 1937. Apr. 3. Vol. 51. No. 14. pp. 431–441. With 1 chart.

Thirteen cases form the basis of the authors' remarks. Of the total, 11 were adults, 2 were children, the ages ranging between 6 months and 60 years, the duration of disease between 5 and 14 days; in one patient only was the disease mild, twelve were severe and nine died. Agglutination tests were carried out with nine strains of *Proteus*, with varying results. The clinical course, transmission by tick (*Amblyomma cajennense*), the serological findings indicate a close connexion with Rocky Mountain fever and the São Paulo type. The dog was found to be a reservoir host. No primary *tache* was seen; in a certain proportion of guineapigs inoculated Rickettsia were observed in the peritoneal cells. *H. H. S.*

MOREIRA (João Affonso) & DE MAGALHÃES (Octavio). Typho exanthematico de Minas Geraes. (8a communicação.) [**Exanthematic Typhus at Minas Geraes.**]—*Brasil-Medico.* 1937. May 22. Vol. 51. No. 21. pp. 583–584.

Three clinical types are met with: ambulant, severe, and fulminating, and the severe cases have high fever, nervous phenomena

and widespread rash. The infection is commonly spread by *Amblyomma cajennense* or its nymphs, less often by *Cimex lectularius*, and possibly by *Rhipicephalus sanguineus*. The following animals have been found infected in nature: the opossum (*Didelphys marsupialis*), the house dog (*Canis familiaris*), wild dog (Cachorro do matto, *C. brasiliensis*), the rabbit (*Sivilagus minensis*), *Cavia aprea* and, less certain, the agouti (*Dasyprocta azarae*). The serum of patients agglutinates *Proteus OX19* and *P. OX2* strongly, *P. OXK* weakly. The fever is closely allied to Rocky Mountain spotted fever. *H. H. S.*

Dias (Emmanuel), Martins Amilcar V.) & Ribeiro (Domingos J.). Typho exanthematico no oeste de Minas Geraes. Reacções de Weil-Felix positivas obtidas com o sóro de communicantes e de cães. [**Exanthematic Typhus in Western Minas Geraes.**]—*Brasil-Medico.* 1937. June 12. Vol. 51. No. 24. pp. 651–655. English summary.

During the past three years cases of endemic typhus have been seen in the municipality of Pitanguy, western Minas Geraes, but in houses widely separated, perhaps as much as a mile apart. They occurred in the cold, dry months when ticks are common, *Amblyomma cajennense*. One of these was caught and found infective. The serum of patients and of some of the local dogs gave a positive Weil-Felix; one of the former in a dilution of 1 in 160 with *Proteus OXL*, and another with *Proteus HX19* and dogs to the same titre. It is thought that the dog is the local reservoir host, since a specimen of the same tick obtained on one of these animals was found infective and the animal's serum gave a positive Weil-Felix reaction. *H. H. S.*

von der Borch (R.). **Non-Epidemic Typhus: a Report on Fourteen Cases occurring on the Goldfields, Wau, Mandated Territory of New Guinea, between January 1, 1935, and June 30, 1936.**—*Med. Jl. Australia.* 1937. Mar. 20. 24th Year. Vol. 1. No. 12. pp. 435–439. With 6 figs.

Fourteen cases of a severe typhus-like fever are described; all these cases showed a very definite primary sore. The cases were all in white people and occurred among those working at clearing the bush, chiefly on the banks of creeks.

The incubation period was probably 10 days, onset sudden, with headache. Later the cases became typically typhus-like and very toxic, with stupor and low muttering delirium; two of the patients died. A macular rash was noted in all the cases.

The suspected vector is a Trombicular mite known locally as "the mocca." The Weil-Felix reaction was positive for *Proteus OXK*, negative for *OX19* [see paper by Gunther below, p. 851]. *D. H.*

Durieux (C.), Rivoalen (A.) & Mathis (Maurice). Premiers cas de typhus bénin diagnostiques à Dakar. [**First Cases of Benign Typhus diagnosed in Dakar.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 124–128.

Five cases of endemic typhus are described; the Weil-Felix reaction was positive in dilutions of 1/2,000 to 1/5,000 for *Proteus OX19*, a rash was not observed in any of the cases.

Rats were very numerous in the houses in which the cases occurred and a typhus virus was isolated from some of these rats. Blood was taken from one of the patients and inoculated into guineapigs; this inoculation was followed by fever but there was no orchitis.

D. H.

Durieux (C.) & Arquié (E.). Le typhus endémique au Sénégal. Étude du virus isolé de l'homme. [**Endemic Typhus in Senegal.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 343–347.

Six more cases of endemic typhus are reported in Senegal, making 11 in all. These cases had fever for about 14 days and also a typical macular rash with a strong positive Weil-Felix reaction for *Proteus OX19*.

Two strains of the virus were isolated from the blood of the patients. This virus produced fever and orchitis in guineapigs and later these animals were shown to be immune to a known typhus virus. Since the above paper was written another case has been met with. This case was fatal. *D. H.*

Modinos (P.) & Vassiliadis (P.). Description d'un cas de typhus murin à Alexandrie. [**Description of a Case of Endemic Typhus in Alexandria.**]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1047–1052.

The patient was a man, aged 60, employed in a cotton store in the docks. He had fever, with intense headache; on the fourth day a rash developed and later became a typical typhus rash. The fever ceased on the 14th day. The Weil-Felix reaction was positive in 1/1,600 with *Proteus OX19*. There were no other cases in the family. Guineapigs were infected with blood taken from the patient during the fever. Fever and orchitis was noted. Thirty-one rats were captured in the store and their blood tested, but none showed a positive Weil-Felix reaction. The brains of 20 of the rats were emulsified and injected into a guineapig, this developed fever and was later proved to be immune to a human virus. *D. H.*

Ruiz (Calonge) & de Landazuri (Ortiz). **Fièvre boutonneuse in Spain and its Experimental Transmission by Ticks. A Preliminary Note.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 539–540. With 1 map and 3 figs. on 1 plate.

During the last few years 80 cases of boutonneuse fever have been studied in hospital in Madrid.

The blood from cases was taken during the fever and inoculated into two patients suffering from nervous diseases; both developed typical attacks of the fever. Ticks were collected from dogs in houses where cases had occurred. These were emulsified and the emulsion inoculated into a volunteer; a typical attack of boutonneuse fever followed. *D. H.*

Banerji (R. N.). A Case of Tick Typhus at Allahabad.—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 297–298.

Breinl (Friedrich), with Chrobok (Eugen). Die Erreger des Fleckfiebers und des Felsengebirgsfiebers. [**The Viruses of Typhus and of Rocky Mountain Fever.**]—*Zent. f. Bakt.* I. Abt. Orig. 1937. Jan. 15. Vol. 138. No. 3/4. pp. 129–137. With 3 figs.

Previous work on tissue culture of typhus viruses by the writers and others is referred to. The method of culture employed in the present research was to infect the tissues of normal guineapigs by immersion in an emulsion of infected brain and spleen, the small pieces of tissues were then placed in special flasks containing fluid media consisting of 1 part normal guineapig serum and 2 parts Tyrode solution. The cultures were then incubated at 37°C. for 7 days and then subcultured. Small pieces of the tissue were removed and placed in fresh media and the remainder of the old culture was used for inoculation of guineapigs and rabbits. The cultures were proved to be virulent by the production of fever in guineapigs and a positive Weil-Felix reaction in rabbits.

The strain of typhus virus used was subcultured successfully 19 times and the strain of spotted fever virus 16 times. Rickettsia could be readily demonstrated in the cultures after the 4th passage in the case of the typhus strain and the 6th in that of Rocky Mountain fever. Changes were made in the normal tissue used; tunica, muscle fibre, brain, spleen, etc., and the sera of man, horse, cattle, pig and rabbit were all utilized and the results are set out in tabular form. The best results as regards the multiplication of Rickettsia were obtained when the tunica tissue of a normal guineapig and the serum of normal guineapigs were utilized. Tissue and serum from immune guineapigs was also tested and it was found that these do not hinder the multiplication of Rickettsia in the culture, but on the other hand in the cultures in which immune sera were used agglutination of the Rickettsia was noted. *D. H.*

Brigham (George D.). **A Strain of Endemic Typhus Fever isolated from a Field Mouse.**—*Public Health Rep.* 1937. May 21. Vol. 52. No. 21. pp. 659–660.

In Alabama it has been noted recently that endemic typhus has spread from the towns to the country districts and cases have occurred where the rat was "a highly improbable causative factor."

In view of this fact, investigations have been proceeding to determine what species of native rodents are susceptible to typhus virus and might possibly serve as reservoirs of the disease.

A field mouse was trapped on rural premises in Alabama. Its brain was removed and half of it was injected intraperitoneally into each of two guineapigs. Both guineapigs developed fever and the strain was established. Ninety guineapigs have been used and of these 77 gave a typical fever with scrotal enlargement, 6 fever and slight swelling and 2 fever only. Crossed immunity experiments with a known virus were positive. *D. H.*

Brigham (George D.). **Susceptibility of Animals to Endemic Typhus Fever.**—*Public Health Rep.* 1937. May 21. Vol. 52. No. 21. pp. 660–662.

Three field mice were inoculated with the local (Wilmington) virus of endemic typhus; all three became infected. A cotton mouse and

a golden mouse were also susceptible; and three species of wild rats were also infected. A cat was also infected and suffered from fever. The virus was recovered from its blood on the 7th day and from the brain on the 14th day. Eight racoons were inoculated with the virus, but none became infected. *D. H.*

Sparrow-Germa (Hélène). Endémie typhique sur la population murine de Tunis. Aptitudes vaccinales d'un virus murin isolé à Tunis. [**Endemic Typhus Virus in Tunisian Rats.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Apr. Vol. 29. No. 4. pp. 719–729.

During a period of three years some 1,000 rats and 300 mice were examined in the port of Tunis and three strains of typhus virus were isolated from the rats and two strains from mice. The reactions of rat typhus virus No. 1 of Tunis have already been fully described in previous papers; the strains isolated from the mice gave similar reactions. About 5 per cent. of the sera of the rats examined gave positive Weil-Felix reactions. It is obvious that the infection among the rats of the port of Tunis is widespread, yet during the three years over which the investigation extended, only one case of typhus in man was met with; on the other hand cases of infection in the laboratory among people who handled infected tissues were common. *D. H.*

i. Baltazard (M.). Typhus murin expérimental; voies d'introduction et réceptivité. [**Experiments with the Virus of Rat Typhus. Routes of Introduction and Receptivity.**]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 5. pp. 425–427.

ii. Blanc (Georges) & Baltazard (M.). Action de la bile sur le virus du typhus murin. [**Action of Bile on the Rat Typhus Virus.**]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 5. pp. 428–429.

i. 0·3 cc. of virus diluted 1/250 was inoculated intradermally into four men; 48 hours later a local reaction developed, followed by fever and all four men had typical attacks of endemic typhus. The same amount of virus diluted 1/2,000 was inoculated in the same way, with a like result.

ii. Bile treated vaccine produces no reaction in man, but if inoculated intraperitoneally into guineapigs produces fever, and if inoculated intradermally no reaction or fever follows. *D. H.*

Violle (H.). Contribution à l'étude du virus exanthématique murin, en particulier chez le lapin. Sa persistance dans l'organisme de cet animal. Son importance éventuelle dans la préparation de vaccins. [**The Virus of Murine Typhus in the Rabbit.**]—*Bull. Acad. Méd.* 1937. May 18. 101st Year. 3rd Ser. Vol. 117. No. 19. pp. 543–548. With 2 figs.

Two rabbits were inoculated intraperitoneally, one with the infected brain of a rat and the other with the brain of a guineapig; both became infected and had slight fever, but no other symptom. The two rabbits were killed two months later and brain emulsion was inoculated into two rats and two guineapigs. Both the rats developed fever; one recovered. In the other the temperature dropped suddenly to 24°C. and the animal died. When passaged in other rats the same curious effect on the heat centre was noted and most of the

animals died in hypo-therma. The guineapigs had only slight fever and no orchitis ; apparently the virulence of this virus was increased for rats but decreased for guineapigs by passage through the rabbit. However, when the strain was further passaged in rabbits the virulence for rabbits was increased, but was decreased for rats. The authors suggest that as they have shown that the virus remains alive for at least a month in the brain of the rabbit, this animal might be utilized for the preservation of the virus and also for the production of vaccine instead of the guineapig. *D. H.*

Blanc (Georges) & Baltazard (M.). L'influence du jeûne sur la persistance du virus du typhus murin chez la puce *Xenopsylla cheopis*. [**Effect of Starvation on the Virus of Murine Typhus in Fleas.**]—*C. R. Acad. Sci.* 1937. Mar. 15. Vol. 204. No. 11. pp. 919–920.

If fleas are fed on an infected rat and then starved they will not infect a guineapig, but after a second feed they become infective ; a feed of blood is necessary for the multiplication of the Rickettsia in the intestine of the flea. Once infective fleas remain so, even if starved over long periods. *D. H.*

Blanc (Georges) & Baltazard (M.). Longue conservation à sec du virus du typhus murin dans les déjections des puces infectées. [**Viability of Murine Typhus in Dejecta of Infected Fleas.**]—*C. R. Acad. Sci.* 1937. Mar. 31. Vol. 204. No. 13. pp. 1046–1048.

The authors found that the virus of murine typhus is viable in the faeces of infected fleas for 21 days ; the faeces were preserved on paper in a Petri dish in the dark at room temperature. In dried fleas the virus was viable up to the 7th day and for the same period in rapidly dried faeces. The authors emphasize the danger of the spread of the disease by means of dried faeces of infected fleas. *D. H.*

Starzyk (Jan). Vitalité, toxicité et pouvoir d'immunisation de *Rickettsia prowazeki* conservées hors de l'organisms du pou, en milieu liquide et en milieu sec. [**Vitality, Toxicity and Immunizing Power of *Rickettsia prowazeki* preserved outside of the Body of the Louse in Liquid and Dry Media.**]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 36. pp. 1221–1225.

The virus remains alive for some hours outside of the lice in normal saline solution and for some days in human serum.

In dried lice faeces the virus was still alive after 66 days, and in dried lice intestines for 54 days. *D. H.*

Sparrow (Hélène). Un cas de typhus murin chez l'homme à Tunis. Etude du virus. [**Human Infection by Murine Typhus.**]—*Arch. Inst. Pasteur de Tunis*. 1937. Mar. Vol. 26. No. 1. pp. 151–155.

A man employed in a grain store in Tunis developed fever, typhus was suspected and the Weil-Felix reaction was found to be positive in a titre of 1,1600. Blood was taken from the patient on the 10th day of fever and after some difficulty the virus was isolated in rats

and was passaged by intraperitoneal injection of the brain emulsion from rat to rat and rat to guineapig. This virus produced fever in the rats and fever and orchitis in guineapigs.

The virus protected against rat virus No. 1 of Tunis and also against a historical or epidemic typhus virus ; an interesting point is that although a typhus virus had been readily isolated from rats in Tunis, this is the first occasion when the virus was isolated from man.

D. H.

Arlo (J.) & Fortin. Un cas de typhus murin observé à Marseille. [**A Case of Murine Typhus in a Man at Marseilles.**]—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 216–219.

A young soldier, who was employed in a grain store in which there were numerous rats, contracted endemic typhus. He had severe headache and a profuse typhus rash which involved the palms of the hands but not the face ; no *tache noire* could be detected, the man was not in contact with dogs, also the case occurred in the season of the year when ticks are not to be found.

The Weil-Felix reaction was positive in a dilution of 1/1,500 during convalescence. The blood of the patient was inoculated into a guinea-pig and produced fever and orchitis. *D. H.*

Pijper (Adrianus). Etude expérimentale comparée de la fièvre boutonneuse et de la tick-bite-fever. [**Boutonneuse Fever and Tick-bite Fever Compared.**]—*Arch. Inst. Pasteur de Tunis.* 1936. Nov. Vol. 25. No. 3 & 4. pp. 388–401. With 10 figs. [29 refs.]

The clinical, epidemiological and serological differences between the two diseases are stressed.

The present paper deals with the results of crossed immunity experiments. The virus of boutonneuse fever was obtained from *Rhipicephalus* ticks sent from Tunis by air to Pretoria. The virus was successfully isolated from the 3rd batch of ticks received. Two strains of tick bite fever virus were used and 1 strain of typhus (South African). The results are given in tabular form.

Guineapigs	1st inoculation Virus	2nd inoculation Virus	Results
6	F.B.	T.B.F.	No immunity
7	T.B.F.	F.B.	,, ,,
9	F.B.	T.S.A. louse	,, ,,
6	T.S.A. louse	F.B.	3 G.P's. no immunity 2 ,, immunity 1 G.P. ,, feeble
	T.S.A. louse	T.B.F.	Immunity
	T.B.F.	T.S.A. louse	No immunity

F.B. = Virus of boutonneuse fever.
T.B.F. = Virus of tick-bite fever.
T.S.A. = Virus of typhus (South African louse borne).

There was no crossed immunity between the viruses of tick-bite fever and boutonneuse fever nor did the virus of boutonneuse fever protect from the virus of South African typhus, but the virus of South African typhus showed some evidence of protection against the virus of boutonneuse fever. *D. H.*

GUNTHER (Carl E. M.). **The Serology of Sixteen Cases of Endemic Typhus in New Guinea.**—*Med. Jl. Australia.* 1937. Mar. 20. 24th Year. Vol. 1. No. 12. pp. 439–440.

This paper refers to the cases described above in the paper by VAN DER BORCH. The sera giving a positive reaction agglutinated *Proteus OXK* in rising titre 1/80, 1/160 and 1/320, the highest titre in any of the cases was 1/5,120; others gave a reaction for 1/2,500 and 1/640. *D. H.*

DELBOVE (P.) & NGUYEN-VAN-HUONG. La réaction de Weil et Félix chez les rats de Saigon-Cholon. [**Weil-Felix Reactions with Rat Sera in Saigon.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 128–131.

During the years 1934, 1935 and 1936 the sera of 1,300 rats were tested. 117 of these showed a positive reaction in a dilution of 1/100 or higher. *Proteus OX19* was most frequently agglutinated but *OXK* was agglutinated in 14 instances, *OX2* not at all. *D. H.*

PARROT (Georges-Victor). Le problème de l'immunité dans les Rickettsioses (immunité ou prémunition ?). [Thesis for Doctorate of Medicine.]—63 pp. [Bibliography.] 1937. Algiers.

SPARROW (Hélène). Essai de vaccination de l'homme par voie oculaire avec le virus murin I de Tunis. [**Vaccination of Man against Typhus by the Ocular Route, using Murine Typhus Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1937. Mar. Vol. 26. No. 1. pp. 13–21. With 2 figs.

Emulsion of the infected guineapig brain was made and a drop of this instilled into the eyes of four volunteers; no fever resulted and there was no rise in the Weil-Felix reaction. This was repeated and in two instances slight fever followed in the inoculated persons and a rise in the titre of the Weil-Felix reaction was noted. It was not, however, possible to test these people for immunity. *D. H.*

SPARROW (Hélène). Essais d'immunisation contre le typhus avec le virus murin I de Tunis introduit par voie nasale. [**Vaccination against Typhus by Nasal Instillation of the Murine Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1936. Apr. Vol. 25. No. 2. pp. 284–294.

No reaction was noted when the virus, emulsion of brains of infected rats, was instilled into the nostrils of monkeys and guineapigs; when tested later the animals were found to be immune. A few drops of the same emulsion were placed in the nostril of a young man, who developed a very definite but mild attack of typhus, complicated by a severe sore throat; his blood was not infective for guineapigs nor was his blood infective for lice which were fed on him during the fever. *D. H.*

Sparrow (Hélène). Essais de vaccination avec les rickettsias du virus murin I de Tunis. [**Vaccination with Virus of Murine Typhus.**]—*Arch. Inst. Pasteur de Tunis.* 1937. Mar. Vol. 26. No. 1. pp. 22–26.

Emulsions of Rickettsia were made from lice intestines; these emulsions were instilled into the eye and nostrils of experimental animals, there was no reaction; but when tested later with a typhus virus the animals were immune. In previous experiments with this virus when passaged in lice, it was noted that there was loss of virulence as compared with the same virus passaged in rats, but on this occasion the virulence increased much above that of the rat passage virus.

D. H.

Giroud (Paul). Etude des réactions provoquées par les cultures desséchées du virus typhique murin. Immunités qu'elles confèrent vis-à-vis du virus historique. [**Immunity in Animals by Injection of Dried Virus of Murine Typhus.**]—*Arch. Inst. Pasteur de Tunis.* 1936. Nov. Vol. 25. No. 3 & 4. pp. 419-423.

Cultures of rat typhus virus No. 1 were made and dried and the powder rubbed up in yolk of egg, this vaccine was inoculated intradermally in monkeys and guineapigs, this caused a slight local reaction (small nodule) and fever. Two or three doses of the vaccine produced immunity in guineapigs and monkeys. *D. H.*

Blanc (Georges) & Baltazard (M.). Transmission expérimentale du typhus murin par la puce de l'homme (*Pulex irritans*). [**Experimental Transmission of Murine Typhus by** *Pulex irritans.*]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 11. pp. 1058–1059. [14 refs.]

Fleas (*P. irritans*) were fed on infected rats for a few hours, the infected rats were then removed and normal rats placed in the cage, then fresh normal rats were placed in the cage every two days. The normal rats became infected and the fleas were shown to be infective by injection into guineapigs. In fact, *P. irritans* was shown to be as readily infected as the rat flea. *D. H.*

Blanc (Georges) & Baltazard (M.). Non-transmission à l'homme du typhus murin par piqûres de puces infectées ("Xenopsylla cheopis et Pulex irritans"). [**Murine Typhus not transmitted to Man by Bites of Infected Fleas.**]—*Bull. Acad. Méd.* 1937. Apr. 20. 101st Year. 3rd Ser. Vol. 117. No. 15. pp. 434–446. With 13 charts and 4 figs. [24 refs.]

The authors review the literature as regards the infection of rats by fleas, the conclusions they draw are that rat typhus is transmitted primarily among rats through the skin soiled by the faeces of infected fleas or by the crushed bodies of fleas, the virus gains admission either through lesions, scratches, etc., or through the small wounds made by the flea when biting; alternatively, the virus may enter through the mucous membranes or by the digestive route, the fleas being swallowed or faeces licked off the skin and swallowed; or, again, the rat may swallow food contaminated by the faeces of fleas or by the urine of other infected rats, or rats may be infected by eating other infected rats.

In all these ways the flea plays the principal rôle, at first as a multiplier of the virus and secondly as a reservoir. But the authors do not consider that the simple bite of the flea accounts for the infection of the rat or of man provided that contamination of the wounds with infected faeces is excluded. In order to demonstrate this point they carried out a series of experiments, two with *X. cheopis* and two with *Pulex irritans*.

Fleas were fed on infected rats and volunteers allowed these fleas to bite their arms ; in two of the experiments the volunteers scratched the bitten area and in two cases in which the arm was placed in a glass jar they could not do so. In all cases the fleas were seen to bite and photographs are given which show the clear evidence of their bites, also in all cases the fleas that had bitten were subsequently shown to be infective.

In none of the four volunteers was there any evidence of infection, although in two instances the skin was contaminated with the faeces of infected fleas and the patient had scratched the area. The authors conclude that the rôle of the flea as a vector of typhus murin from rat to man is practically nil, and it would appear that the ordinary route of contamination of man is above all by the mucous membranes (ocular, digestive, nasal) and that one of the methods of contamination by this route is by the excreta of infected rat fleas. *D. H.*

Okamoto (Yutaka). **Experimental Studies on Mice concerning Typhus Fever. I. Demonstration of Rickettsia in Fixed Tissue Sections from Organs of Mice Inoculated with Endemic Typhus Virus.**—*Kitasato Arch. Experim. Med.* 1937. Jan. Vol. 14. No. 1. pp. 23–28. With 6 figs. on 1 plate.

The author recommends the use of sections rather than smears to demonstrate the distribution of Rickettsia in infected animals.

He finds that in mice infected with the virus of endemic typhus by the peritoneal route, Rickettsia could be demonstrated in practically all the organs of the body when sections were prepared and stained by Giemsa method. These sections showed cells crowded with Rickettsia and also the relation of these cells to other types of cell. Rickettsia were most abundant in the serous membrane of the testes and in the capsules of the liver and spleen. They were also found in the endothelial cells of the pleura, pericardium and diaphragm, and also in the serous membranes of stomach, intestine, bladder, pancreas and capsule of the kidney. The Rickettsia cells were also found in parts far away from serous membranes, as, for instance, in the alveola of the lungs and in endothelial cells in the liver and spleen. *D. H.*

Philip (Cornelius B.). **Six Years' Intensive Observation on the Seasonal Prevalence of a Tick Population in Western Montana. A Preliminary Summary.**—*Public Health Rep.* 1937. Jan. 1. Vol. 52. No. 1. pp. 16–22. With 1 fig.

A 40-acre tract was selected and ticks were collected by drawing a cloth over the grass and bushes once a week. Ticks began to appear as soon as the snow melted in February or March ; the maximum numbers were obtained as a rule in April and the ticks disappeared

in July. The numbers of ticks varied from year to year and from week to week, but this was found to be due principally to the difficulty of collection. *D. H.*

KOHLS (Glen M.). **Hosts of the Immature Stages of the Pacific Coast Tick *Dermacentor occidentalis* Neum. (Ixodidae).**—*Public Health Rep.* 1937. Apr. 16. Vol. 52. No. 16. pp. 490–496. [Summary appears also in *Bulletin of Hygiene.*]

Dermacentor occidentalis, the common wood tick of the Pacific Coast region, which occurs in Western Oregon and Western California, has been found in the adult state naturally infected with *Bacterium tularense*. Although unsupported by direct evidence apart from that obtained in experimental conditions, epidemiological observations suggest its being also a vector of human Rocky Mountain spotted fever, while, in both its larval and nymphal states, it has been thought to be the chief carrier of bovine anaplasmosis in California. Since *Bact. tularense* has been obtained from adult ticks, it was suggested by PARKER, PHILIP and JELLISON (1933) that the immature stages would be found on small mammals. This suggestion is confirmed in the present paper, which gives the results of investigations carried out in Oregon in 1935, and in California in the following year. It appears that a wide variety of animals serves as hosts of the immature stages of *D. occidentalis*; but, owing to their abundance and general distribution in tick-infested regions, ground squirrels (*Citellus douglasii* and *C. beechyi*) and deer mice (*Peromyscus* spp.) are of major importance in this respect. *E. E. Austen.*

SOUCHARD & TOURNIER. Un nouveau cas de typhus exanthématique type fièvre fluviale observé en Indochine. [**Typhus of the Mite Fever Type in Indo-China.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 257–261. With 3 figs.

A severe case of fever with stupor and tremors of hands, and macular rash with primary sore on the left elbow; the Weil-Felix reaction was positive for *Proteus OXK* negative for *OX19*.

Two guineapigs were inoculated with the blood of the patient taken during the fever, these developed slight fever, but there were no other symptoms. This virus was passaged in guineapigs and the virulence was greatly increased, the majority of the inoculated guineapigs died 8 or 9 days after inoculation. Guineapigs which recovered from the fever were not immune to a test typhus virus.

The disease in its clinical aspects and in its effect on guineapigs resembles the mite fever of Sumatra and the scrub typhus of Malaya. *D. H.*

DENGUE AND SANDFLY FEVER.

PURCELL (F. M.). **A Dengue-like Fever in the Gold Coast.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 541–544.

In parts of the Gold Coast Colony a form of dengue fever, which affects Europeans, prevails; immigrant Africans may also be infected.

A brief clinical description of some of the cases is given in the present paper. The endemic centres of the disease lie in the forest country in the rainy belts. Cases are not met with in the coast towns or cleared areas. The incubation period is 2 or 3 days and the fever may last from 3 to 10 days. The fever is remittent and a scarlatiniform rash appears on the 4th day as a rule. The patient complains of pain behind the eyeballs, photophobia and pains in muscles and joints. *D. Harvey.*

Massa (Filippo) & de Vivo (Antonio). Episodio epidemico di dengue a Bender Cassim, nel golfo di Aden. [**Outbreak of Dengue at Bender Cassim, Gulf of Aden.**]—*Giorn. Ital. di Clin. Trop.* 1937. Mar. 31. Vol. 1. N.S. No. 3. pp. 78–79. With 1 fig.

The outbreak started in two sailors being attacked early in May [? 1936] and by the 19th June 64 out of 68 white residents contracted the disease. They were stationed in the marine barracks, the radio station and the administrative quarters. Thirty-six were clinically typical, 29 are said to have been atypical [*i.e.*, a total of 65, whereas the text mentions 64 and the table of details adds to the same figure] with a crisis on 5th, 7th, or even 10th day. The leucopenia was characteristic. The origin of infection was not traced, but it is thought infected persons or mosquitoes, *Culex fatigans*, in caravans from the interior may have introduced it. *H. H. S.*

di Giuseppe (Francesco). Considerazioni su alcuni casi di febbre dengue. [**Observations on Cases of Dengue Fever.**]—*Policlinico.* Sez. Prat. 1937. Mar. 29. Vol. 44. No. 13. pp. 610, 613–14, 617–18. [33 refs.]

The author makes some general remarks on dengue fever and records observations on fourteen cases seen by him in Italian Somaliland. They differ in no material point from cases as seen elsewhere, but he stresses the usefulness of the punctate erythema of the palate and the painful enlarged cervical lymph glands (Castellani's signs) in diagnosis. *H. H. S.*

Coles (Alfred C.). **An Inquiry into the Aetiology of Dengue Fever.**—*Jl. Trop. Med. & Hyg.* 1937. Mar. 1. Vol. 40. No. 5. pp. 53–55. With 2 figs.

The material on which this paper is based consisted of blood films obtained from 8 patients who had suffered from dengue during the 1928 epidemic in Athens. These films were taken on the 2nd and 3rd day of the fever. These air dried blood films were received by the author in October 1931. In addition films were obtained from two volunteers who had been inoculated with dried serum from cases of dengue. These films were sent by Dr. Schüffner from Amsterdam and were taken, before symptoms appeared, and daily during the fever; these were received in December 1931. The films were fixed in alcohol and stained with well diluted Giemsa stain for 10 to 12 hours. In all the films taken from the cases of fever during the first 3 days of the disease small intracorpuscular bodies were seen. These were diplococcal or small bacillary forms and measured 0·25 and 0·4 μ in diameter and were stained a bluish red.

These bodies were most numerous in the severe cases and were not seen at all in the films taken before fever commenced or after the 3rd day of the fever. Although the author does not claim that these bodies are actually the virus or germ of the disease he considers that they are certainly associated with it, and suggests the name *Maculae dengui* for these small bodies. Microphotographs demonstrating the bodies in the red cells are reproduced, also diagrams. *D. H.*

i. Moshkovsky (S. D.). **Studies on Pappataci-Fever. I. Five Years' Work of the Tropical Institute on the Study of Pappataci-Fever.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 6. pp. 823–826. [In Russian.]

ii. ——, Demina (N. A.) & Pavlova (E. A.). **II. On the Epidemiology of Pappataci-Fever.**—*Ibid.* pp. 827–831. [In Russian.]

iii. ——, Russinkovskaia (E. B.), Demina (N. A.) & Pavlova (E. A.). **III. The Blood Changes in Pappataci-Fever.**—*Ibid.* pp. 832–837. [In Russian.]

iv. ——, Demina (N. A.), Nossina (V. D.), Epstein (E. F.), Melikhan-Shenina (M. L.), Basina (B. S.), Pavlova (E. A.) & Wunder (M. A.). **IV. The Properties of Pappataci-Virus.**—*Ibid.* pp. 838–843. [In Russian.]

v. ——, Demina (N. A.), Nossina (V. D.), Pavlova (E. A.), Livschitz (I. M.) & Wunder (M. A.). **V. On the Immunology of Pappataci-Fever and Attempts to produce Artificial Immunization.**—*Ibid.* pp. 844–849. [In Russian.]

vi. ——, Nossina (V. D.) & Latishev (N. J.). **VI. Data on** *Phlebotomus pappatasii.*—*Ibid.* pp. 850–851. [In Russian.]

In this series of papers are reported the results of five years' investigations on pappataci fever conducted under the direction of Prof. Moshkovsky in the Crimea and in Moscow.

i. The first report deals with the personnel, the general programme of work and future plans.

ii. In the second paper an analysis is given of the incidence of pappataci fever among the immigrant part of the population of Sebastopol. This is distinguished from the incidence among the settled population of the endemic area under the name *loimopotential* (λοιμός = pestilence), corresponding to Ross' "inoculation rate" in malaria.

iii. The most characteristic change in the blood-picture, recorded for the first time, is the sharp diminution in the number of lymphocytes (average 500 per cmm.) during the first and sometimes second day of the disease.

iv. The properties of pappataci virus were studied in volunteers and in mental cases. Sera taken from patients up to 24 hours after the onset of fever proved to be virulent, the incubation period normally varying from 3½ to 5 days. During the incubation period the virus could be detected 1–2 days before the rise of temperature. Serum taken on the third day of the disease was non-infective.

The effect of various chemical and physical agencies upon the virus was found to be as follows: 19 parts of bile to 1 part virulent serum killed the virus. The addition of 3 parts of bile to 1 part of virus diluted in 10 parts Ringer's solution had a similar action, but was ineffective in the case of 5-fold dilutions or undiluted virulent serum. Equal volumes of glycerine and serum diluted in Ringer's

solution remain virulent 3 days if the dilution is 5-fold, and 1 day if 10-fold, when it loses its virulence after 10 days. A mixture of serum and Ringer's solution 1 : 1 and 4 parts glycerine kept 1 day at 37°C. and 4 days in the ice-chest loses its virulence; 1 part of 2 per cent. solution of phenol added to 1 part of serum diluted with Ringer's solution (1 : 4) kills the virus. When heated to 54°C. during five minutes the serum retains its virulence, but loses it after being heated at 55°C. during 30 minutes. Serum and whole blood dried in a thin layer and kept for three years with access of air became non-virulent.

When kept in an ice-chest the sera remained virulent for periods up to six months.

All attempts to detect the virus morphologically failed, nor was it possible to cultivate the virus. Inoculation of the serum to various laboratory animals (intracerebrally to mice) produced no symptoms in them. Attempts to infect human volunteers with brain emulsion of inoculated mice were negative.

v. The attempts to produce artificial immunization against pappataci fever by using attenuated or killed virus, convalescent sera, alone and with virulent serum, produced inconclusive results. The limited data on acquired immunity show that about 6 per cent. of cases are liable to re-infection in the course of the same season.

vi. The last paper deals with the bionomics of and methods of combating sandflies in Sebastopol. *C. A. Hoare.*

Le Gac (P.) & Albrand (L.). Note sur les modifications du liquide céphalo-rachidien au cours de la fièvre à *pappataci*. [**Changes in the Cerebrospinal Fluid in Pappataci Fever.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 354–356.

The interesting point in this report is that the authors found that the amount of albumen in the fluid was much above normal, whereas the cell count was low, not more than 11 per cmm., and these were all lymphocytes. *D. H.*

HELMINTHIASIS.

King (E. L.), Faust (Ernest C.) & Sanders (John T.). **Intestinal Parasitic Infections complicating Pregnancy.**—*Southern Med. Jl.* 1937. May. Vol. 30. No. 5. pp. 545–548. [12 refs.]

Routine examinations of faeces were made during 6½ years on 3,290 white obstetric patients, the total examinations on them being over 5,000.

The method of examination is not stated. The percentages of infections found were *E. histolytica* 10, *G. lamblia* 5, necator 5·6, trichuris 4, enterobius 0·7, ascaris 3·5, *T. saginata* 0·09, *H. nana* 0·33. "The women were from both rural and urban areas, in the ratio of 55 per cent. rural and 45 per cent. urban. If they had been subdivided into these two groups, the percentages would have been found to be higher in the rural group, because of the unsatisfactory hygienic conditions of their environments." As to *E. histolytica*, it is said: "This figure was obtained from the examination of one to three stools from each patient, which is universally admitted to be inadequate for a proper survey." A similar comment on the equal need of adequate examination for certainty regarding hookworm or trichuris infection is not made, but this is said of the former. "This condition, too, is a common one, and we feel that for several years its importance as a public health problem has been considerably under-estimated." Various writers are cited for supporting the ill effects of this infection on child-bearing, but curiously enough not that of Stiles in this very journal of 1912, Vol. 5, p. 163. It is urged that pregnant women found infected should be unwormed if possible, the authors' experience being, that so far from causing abortion or premature labour, the consequent improvement has averted this risk. Ascaris should equally be expelled.

In discussion Eastman stressed the ill-effects hookworms have on pregnancy and the puerperium and the need to think of hookworm in any anaemia present during pregnancy; ascaris may be a serious complication during anaesthesia. Guttmacher mentioned cases of foetal infection in women reported by Howard and others, and following Looss, traced the route of infection from skin to the lymphatics, through the nodes to the lymphatic duct into the circulation and by this to the foetus. [The reviewer has already pointed out that the preference of Looss (1911) for the lymphatic route is not necessarily right; it is based on actual findings of larvae in vessels; larvae will readily be found locally in the slow moving lymph current, whereas once they enter a blood capillary they will be carried off in a few seconds. Looss' description of their attack and solution by reticulo-endothelial cells in lymph nodes was striking.] *Clayton Lane.*

Cameron (Thomas W. M.). **Concepts and Mechanisms of Resistance in Helminthic Infections.**—Reprinted from *Canadian Jl. Res.* 1937. Apr. Vol. 15. pp. 77–90. [16 refs.]

"The relations that exist between the helminths and their hosts cannot be divided into specific groups. Nevertheless, it is desirable that some classification of these relations, together with clear-cut definition of terms, be widely accepted in order that the subject may be discussed intelligibly. A tentative classification is suggested, which distinguishes between

(i) compatibility and incompatibility, which refer only to the host environment as it exists before invasion by the parasite; (ii) resistance, of various kinds and degrees, which refers to the reaction of the environment to the *presence* of the helminth; and (iii) tolerance and intolerance, which refer to the reaction of the environment to the *effects* of the helminth."

C. L.

Duprat. Enquête sur la fréquence des vers intestinaux communs à Sao-Paulo. [**On the Prevalence of the Commoner Intestinal Worms in the Inhabitants of São Paulo.**]—*Rev. Méd. et Hyg. Trop.* 1937. Mar.–Apr. Vol. 29. No. 2. pp. 94–103.

Of 2,267 persons examined by the Kofoid-Barber technique, 91·6 per cent. were found parasitized. Details are given by age, sex, and parasites. *C. L.*

i. Scott (J. Allen). **The Incidence and Distribution of the Human Schistosomes in Egypt.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 566–614. With 6 figs. (maps). [23 refs.]

ii. ——. **Observations on Mortality and Morbidity from Schistosomiasis in Egypt.**—*Jl. Trop. Med. & Hyg.* 1937. June 1. Vol. 40. No. 11. pp. 125–132. With 1 map. [10 refs.]

i. The outcome of this discussion may be summed up in a widening of Allen Scott's final question in (ii)—Do steps taken with the intention of raising the economic standard of any area justify a lowering of the standard of health of those who live in it?

In (i) comprising results of 40,000 of the author's examinations it is found that when correlated with some 2,000,000 made in prominent treatment centres schistosome infection in Egypt falls into four distinct regions: (1) on the northern and eastern edge of the Delta reaching as far as Cairo, 60 per cent. of inhabitants have infection with *S. haematobium* and 60 per cent. with *S. mansoni*; (2) in the apical southern half of the Delta (apart from its eastern edge) 60 per cent. of the people have *S. haematobium* but only 6 per cent. have *S. mansoni* and the line between the first and second areas is sharp and defined but " is not paralleled by any noticeable topographic, hydrographic or demographic variations " and there seems no difference in the number of Planorbis snails in these two regions; (3) in the northern two-thirds of the Nile valley, from about Cairo to Assiut, *S. haematobium* infects 60 per cent. of the population but *S. mansoni* and its transmitting snail are absent; (4) in the southern third of the valley where the old basin irrigation, that is irrigation at flood Nile only, takes the place of the new perennial irrigation, *S. haematobium* alone is present, but infects only 5 per cent. of the population. Heavy infection with *S. haematobium* is, then, associated with perennial irrigation from high level canals, this taking the place of flood irrigation with its alternate flushing and drying of the irrigation canals; and it follows that if a large extension of perennial irrigation is put through, there may be expected in present conditions a twelve-fold increase in the incidence or urinary schistosomiasis.

ii. The mortality from schistosomiasis in Egypt is difficult to estimate both when the infection is the direct cause of death and when it indirectly weights the balance against a host with some other illness; the morbidity is still more difficult to assess owing to different types

and severities of illness, but it will be influenced by the weight of infection in the man himself; a classification of morbidity is proposed with 6 categories of infected persons; and the relative effects of ankylostomiasis and ascariasis on schistosome infected are touched on, but are being considered elsewhere. In district 4, where 5 per cent. of inhabitants have infection with *S. haematobium*, 1 in 1,000 die from the infection; in districts 3 and 2, 1 in 40 do so; in district 1, the proportion is 1 in 22. On the other hand when the percentage of the population infected rises from 5 to 60 the average number of eggs passed by each person is increased 100 per cent. in the case of *S. haematobium*; and when the percentage infected with *S. mansoni* rises from 6 to 60 the number of eggs is increased 33 per cent. It is not known whether infection with *S. mansoni* is spreading.

"With regard to the future extension of areas of high *S. haematobium* indexes, we have a more sound basis for prediction. It seems all but certain that the conversion of land from the ancient system of basin irrigation to the modern perennial system has caused a marked increase in the prevalence of this species. At the present time the government programme calls for similar conversion of approximately 700,000 acres in the next decade. The conclusion seems almost inescapable that the proposed changes will not only doom an additional million people to infestation with schistosomiasis, but that the average case in these districts will be at least twice as severe as at present and deaths per case will probably double. . . . . Does the economic improvement expected in these areas to be converted warrant the impairment of the health of such a large proportion of the population?"

C. L.

GOBERT (E.). Traitement de la bilharziose par l'antimonio-thiomalate de lithium (anthiomaline) à Gafsa. [**Bilharziasis treated with Anthiomaline at Gafsa.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 393–398.

Gobert's experience leaves him with the assurance that anthiomaline is a drug active and manageable in the treatment of infection with *Schistosoma haematobium*.

Half the population of Gafsa has this infection. A 6 per cent. solution of the drug is put up in ampoules; the dose given was 1 cc. when body weight was 20 to 30 kgm., 2 cc. when it was 30 to 45 kgm. and 3 to 4 cc. over that weight. It must be given intramuscularly, usually every other day, from 8 to 10 injections being needed to bring about the passage of dead eggs, and the patient must rest for 2 hours after each injection. *C. L.*

FARGES. Essais et résultats de diverses posologies dans le traitement des bilharzioses par l'anthiomaline à la Côte d'Ivoire. [**Results of Different Dosage in the Treatment of Bilharziasis by Anthiomaline on the Ivory Coast.**]—*Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 196-210.

Anthiomaline is considered a marked advance in the treatment of schistosomiasis.

Apparently 91 cases were treated in different ways and from this experience it is concluded that dosage should be high and spaced, namely 1 cc. for every 10 kgm. given at 4 to 7 days' interval, to be

lessened if signs of poisoning come on. But having been powerless to stop a quick endemic extension Farges feels that prevention must have a much wider place in the campaign than it has now. *C. L.*

Marchat (J.) & Couzi (G.). La bilharziose vésicale au 12e régiment de tirailleurs Sénégalais. Stérilisation par l'anthiomaline. **Vesical Bilharziasis in the 12th Regiment of Senegalese Sharp-Shooters cured by Anthiomaline.**]—*Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 211–223.

Forty-one cases were treated at La Rochelle with anthiomaline; the results were excellent.

The observations covered seven months. A total dose of 2·1 grams was quite safe given in 9 injections, namely, 0·12 once, 0·18 twice, 0·24 three times, 0·3 three times [? interval between doses]. Experiments on infecting local snails were negative. *C. L.*

Nain (M.). Note sur les indices d'endémicité de deux foyers de bilharziose vésicale marocaine.—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. p. 237.

Silverie (M.). Note sur l'existence de quelques foyers de bilharziose vésicale dans la région de Morondava.—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 430–432.

Castellani (Aldo) & Jacono (Igino). Contributo alla conoscenza della bilharziosi vescicale.—*Giorn. Ital. di Clin. Trop.* 1937. June 30. Vol. 1. N.S. No. 6. pp. 163–4, 167–70, 173–5, 177. With 13 figs.

Onsy (Anis). **The Pathogenesis of Endemic (Egyptian) Splenomegaly.** —*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 583–600. With 14 figs. on 4 plates. [71 refs.]

"The importance of the rôle played by the spleen in bilharzial infection was not recognised until very recently. This rôle is connected with the various processes of resistance displayed by the splenic tissues when they become invaded by bilharzia ova. The spleen possesses an enormous number of phagocytic cells, *i.e.*, mobile endothelium, reticular endothelium and sinus endothelium, also the large germinal mononuclear cells in the centre of the Malphigian bodies."

"The pathological findings in 1,400 cases of endemic Egyptian splenomegaly are described. The cause of the disease is infection with ova of one or both of the parasites, *Schistosoma haematobium* and *S. mansoni*. The splenic enlargement is due to response of the reticulo-endothelial tissue of the spleen to deposition of ova in it. As a result there is a cellular response which quickly ends in digestion and removal of the solid remains (parts of the egg-shell) of the ova. With frequent repetition of the process, under the condition of perpetual re-infection in which the patients live, there is produced ultimately a condition of permanent hyperplasia and fibrosis. The splenic enlargement is not dependent on either intestinal or hepatic lesions." *C. L.*

Giovannola (Arnaldo). Schistosomiasi intestinale da *S. mansoni* nel Harar e sua trasmissione con il *Planorbis boissyi*. [**Intestinal Infection by** *Schistosoma mansoni* **in Harar; its Transmission by** *Planorbis boissyi*.]—*Riv. di Parassit.* Rome. 1937. Apr. Vol. 1. No. 2. pp. 157–162. With 1 fig.

The author claims to report the first two cases of intestinal schistosomiasis observed in Harar (Italian East Africa). There was enlargement of liver and spleen, dysenteric symptoms, and ova of *S. mansoni*

in the faeces. *Planorbis boissyi* collected locally was negative for cercariae, 34 of them were placed in dilute faeces from one of the cases for 8 hours and 3 became positive later for *Cercaria mansoni*.

C. L.

Scott (J. Allen). **Dilution Egg Counting in Comparison with Other Methods for determining the Incidence of** *Schistosoma mansoni*.—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 546–565. With 2 figs. [16 refs.]

In the examination of faeces for the detection of infection by *S. mansoni* " no one method will detect all the positive cases . . . There is still need for some new procedure applicable to field conditions which will give a high degree of accuracy in the estimation of incidence at low cost."

There were examined nearly 1,100 faecal specimens by three different techniques and by combinations of them, though only 357 were individually examined by all three. There was egg counting by the Stoll-Hausheer method, using 0·005 cc. of faeces [the figure 0·075 for 1/200 cc. is a manifest printer's mistake] diluted in deci-normal caustic soda solution, sedimentation in normal saline, and what is named a concentrated egg count. For egg counting there was used that essential for accuracy, a rectangular field. Sedimentation was carried through in the 357 specimens as described by Tomb and Helmy, 1931 [this *Bulletin*, 1932, Vol. 29, p. 410], while in 234 others it was altered so that while the dilution of the faecal suspension was still 1 in 15, its amount was doubled, and while the fineness of the sieve was the same, namely 100 meshes to the linear inch, its area was more than quadrupled, its diameter being 7 cm. instead of 3 cm. As to the effect of the quadrupled area " no attempt was made to run a long series of distinct checks to compare the two sieves, but in all of the few trials made the larger sieves passed proportionately more eggs." In " concentrated egg counting " the suspension made for the Stoll-Hausheer technique was repeatedly shaken over 24 hours, strained, mixed and poured into a conical urine jar for 30 minutes, tests having showed that by this time 90 per cent. of eggs were in the sediment, even when the lodgement of the rest on the walls of the jar had been disturbed by frequent tapping of its walls over an observation period of 24 hours. At the end of an hour about 99 per cent. of the eggs may be expected in the sediment, but for the classing of a stool as positive or negative, 30 minutes is enough ; for of 100 specimens negative after 30 minutes none showed eggs after standing for 24 hours. In normal saline eggs fell at about the same rate. This concentrating, however, disclosed fewer positives than did the usual technique, for though it did in fact disclose a considerable additional number of positives, there were specimens of heavy counts to the ordinary method which were negative after concentration owing to a flocculation which prevented the fall of eggs, while " the same thing occurred in sedimentation in saline." [Since this method disclosed a considerable additional number of positives, the numbers of specimens showing flocculation must have been yet greater, seeing that the total number the technique disclosed was less than those shown by the original Stoll technique.] Comparison of combination of different methods showed these percentages of positives, taking that by one Stoll-Hausheer slide as 100 : three slides 152, saline sedimentation 166,

saline sedimentation and one slide 182, sedimentation and three slides 196. It is felt that still higher efficiency will be got by the rectal swab. The claims of individual and community are put in these words :—

"He [the clinician] is properly considering only the welfare of the individual before him. Problems of public health, however, are frequently so overwhelming that welfare of the individual must be merged into welfare of the group. In public health work, where the aim is to produce the greatest total effect, it must not be overlooked that in a routine established to deal with groups of people, an occasional person will be destined to receive, or not to receive treatment, whereas careful study would determine the advisability of the opposite course. Even here the frequent occurrence of error, or even occasional drastic incidents must be avoided." *C. L.*

Day (H. B.). **Pulmonary Bilharziasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 575–582. With 6 figs. on 2 plates. [10 refs.]

Three males are reported on, in whom there was direct or presumptive evidence of a pulmonary habitat in infection with *Schistosoma mansoni*.

Two men came to the post-mortem table. One had had ascites and, after tapping, the spleen could be felt one finger's breadth below the costal margin, while the liver could not ; with "tartar emetic in reduced doses" he seemed on the mend, but died of bacillary dysentery (Flexner type) ; bilharzial granulomata, with ova of *S. mansoni* in them, studded parts of the peritoneum ; many female worms without males were present in the splenic vein, but both sexes in the portal ; mesenteric lymph nodes showed the granulomata ; the spleen was moderately enlarged with thickened capsule ; "the liver was slightly nodular with distinct thickening of the portal tracts from fibrosis," and "revealed the presence of ova in fibrotic infiltrations, while there was considerable pigmentation, chiefly in Küpfer's cells" ; the lungs showed many granulomata round schistosome eggs and dilated arteries packed with coupled worms "apparently a pure *S. mansoni* infection," and it is noteworthy that their appearance in the photomicrographs suggest that they have been unharmed by the amount of antimony given ; nor does the text tell of any degeneration noted in them ; the heart was unaffected. The second man died of congestive heart failure with enlarged right heart and conus (shown by X-rays during life) ; the liver was of normal size, but nodular and densely fibrosed ; many bilharzial worms, male and female, were found in the portal vein ; there were ova with "granular infiltration" of the rectal mucosa and a worm in the pancreatic vein. A boy of 10 had some fever, crepitations about the bases of the lungs, but nothing suggestive to X-rays. A sigmoidoscopic examination showed that a *Schistosoma mansoni* infection was present. He was given a diagnosis of an early generalized infection with *S. mansoni*, a prolonged course of tartar emetic, and was discharged in excellent health. Symptoms, diagnosis and treatment are considered in detail. In explanation of the unusual habitat it is suggested tentatively that obstruction of the main portal channels in the liver may open up anastomotic by-passes so that "ova and even worms may reach the lungs without having to pass through normal liver tissue or to travel by the inferior haemorrhoidal plexus." The passages quoted give all that the paper has to say of the actual condition of the liver in these particular cases, though Day adds

" Lampe (1927) has discussed the possibility that cercariae might be able to develop into full grown parasites in the lungs." [See this *Bulletin*, 1927, Vol. 24, p. 986.] *C. L.*

Rose (G.) & Koh (T. M.). Beobachtungen an Oncomelanien bei dem Dorfe Ku Dang (Hanghsien, Chekiang) hinsichtlich ihres Verhaltens und hinsichtlich ihrer Infektion mit Cercarien von *Schistosoma japonicum* im Kreislauf eines Jahres (August 1933 bis Juli 1934). [**A Year's Observation on the Control of Oncomelania and its Infection with** *Cercaria japonicum* **in the Village Ku Dang, Hangsien, Chekiang.**]—Reprinted from *Kongressheft d. Tung-Chi Med. Monatsschrift. 1936. Shanghai.* 25 pp. [In German & Japanese.]

The number of Katayama snails examined by sectioning or by escape of cercariae was 20,864. In July none was infected in any site; the percentage was usually highest, up to 21·1, in November, though in one instance it was higher in May, 13·2 as against 10·8; in all, exactly 600 were infected; of them 171 shed cercariae within 24 hours, 317 more showed on section infective cercariae, and 117 showed sporocysts or immature cercariae. The snails were identified by Fachleuten as *Oncomelania hupensis*, *O. möllendorfi*, and *O. nosofora*. *C. L.*

van den Berghe (Louis). **A Morphological Study of Bovine Schistosomes.**—*Jl. Helminthology.* 1937. Apr. Vol. 15. No. 2. pp. 125–132. With 1 plate & 1 fig. [12 refs.]

The appearance of the review of knowledge on the schistosomes of man [this *Bulletin*, 1936, Vol. 33, p. 1] has prompted van den Bergh to a re-examination of the systematic position of certain schistosomes. He considers that *S. haematobium*, *S. intercalatum*, *S. mattheei*, and *S. bovis* are really biological races of a single species, but he proposes to keep conservatively to two species with subspecies, namely *S. haematobium intercalatum* and *S. bovis mattheei*. *C. L.*

Kenawy (M. R.). **Continuous Venous Hum in Bilharzial Cirrhosis of the Liver.**—*Lancet.* 1937. May 29. p. 1281.

" (1) The continuous venous hum previously recorded in Hanot's cirrhosis and Banti's disease also occurs in endemic (Bilharzial) cirrhosis of the Liver in Egypt, with or without splenomegaly. (2) Six cases have been collected in the last two years. In one of them the hum disappeared after splenectomy. (3) Its disappearance was probably due to removal of some venous communication during the operation." *C. L.*

Rose (G.). **Schistosomiasis in Egypt and its Bearing on the Schistosomiasis Problem in China.**—*Chinese Med. Assoc. Spec. Rep. Ser. No. 2.* 86 pp. Shanghai: 41 Tzepang Road. [2*s.*]

In 1933 Rose spent 5 weeks in Egypt, where he was given orders and permits which insured that he got from all he interviewed the full information, and the facilities to see for himself, which were needful if the experience of antischistosome work in Egypt (where there is promiscuous water and soil pollution, little use of human dejecta as fertilizer and the snails carrying infection are non-operculate) was to

be made available for China (where there was little promiscuous pollution, the dejecta are almost wholly used as fertilizer, and the intermediate snail is amphibious and operculate).

Great stress is laid on the thoroughness of the routine for diagnosis and treatment which obtains in the Egyptian treatment centres, on the sudden antimony deaths, whose reported rarity, 1 in 286,000, it is agreed by all in Egypt does not represent the real state of affairs, KHALIL Bey indeed estimating them as 1 in 2,000 full treatments; the Endemic Disease Section finds that, of some 300,000 who completed treatment, the cure rate was about 75 per cent., and of some 500,000, who did not, about 25 per cent. The need is great for some remedy which combines the cheapness and lightness of carriage of tartar emetic with the painlessness of fouadin when it reaches the tissues, and does not need the prolonged course of injections which both do. Whether a relapse means reinfection or not, and whether these "relapses" respond to treatment in just the same way as do untreated infections is unknown. As to the effects of the Egyptian campaign, "On that point again, complete unanimity exists among all Egyptian specialists. No influence on the mere occurrence of the disease has been obtained by the present methods. But on the contrary, no doubt exists that . . . the grave cases of urinary fistulae, the pyo- and hydronephroses, the numerous urinary calculi, all these serious complications of Egyptian schistosomiasis have greatly diminished in number." But if a quarter only of the infected in Egypt could be treated yearly (that is 10 times the present numbers) it is felt that the results would be very different. As to the transference of this knowledge to the conditions present in China, the first need is more knowledge of the biology of the snail *Katayama nosophora*, and of the effects of treatment on *S. japonicum*. Treatment must be an outpatient one, expense forbids anything else, and the reaction of the Chinese to the drugs must be closely watched, for it may be that race will allow of intensification of treatment by antimony. As to the salt used, fouadin is 362·5 times as costly in Shanghai as is tartar emetic; and the test of cure should be failure of miracidia to hatch from stools on three successive occasions. Treatment should be for removal of worms of all sorts and the centres should deal also with the dysenteries. If these control centres became as popular as in Egypt, they would at least prevent the coming into being of "schistosomiasis cripples." In prevention the first need is to look on Japonic schistosomiasis as an occupational disease of the rice farmer who fertilizes his fields with human faeces; it is only the faeces which are infective here and they are already collected and sorted. To sterilize them by heat is generally looked on as expensive and complicated. But mere storage kills the miracidia, and it should be found out how long this has to be kept up on a mass scale to be effective. The individual farmer cannot be depended on to keep faeces till they are not infective, so a village co-operative organization should be brought into being in charge of a central storage depot to which all faeces would have to be brought and which would see that no fertilizer was issued to farmers, as they would be *pro rata*, till it had been stored long enough to be no longer infective. The success of the scheme would depend on the co-operation of villagers and their elders, and on education and propaganda. Destruction of snails is less hopeful as a first mode of attack, for it has never become generally known whether or not the Japanese, with few and small endemic areas, have ever succeeded in clearing

even one of them of infection by any of the advised methods. It is known that *Katayama* infected with *Cercaria japonica* will not mate, and search should be made as to whether some of the other cercariae which infect these snails will not equally lead to the local dying out of the species. As in Egypt the measures should be controlled by a central committee. *C. L.*

KAWAI (T.). **Experimental Studies on the Clonorchicidal Effect of Gentian Violet. A Supplement : Value of Wakeshima's Egg Counting Method as a Judgment of Anthelmintic Effect of Drugs against** *Clonorchis sinensis.*—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1937. May. Vol. 36. No. 5 (386). [In Japanese pp. 923–933. [47 refs.] English summary p. 934.]

Gentian violet was given to seven dogs and egg counts of *Clonorchis sinensis*, with which they were infected, were made.

" In light infection (worm estimate = 49) 18 mgs. of the drug per kilo of body weight, administered every three days, were sufficient to reduce worms 61·23 per cent. in 15 days (total dose 1200 mgs.). In a moderately infected case (worm estimate = 333) administration of 18 to 20 mgs. per kilo of body weight per diem for 19 days (total dose 3040 mgs.) reduced the worms by 42·32 per cent. In a heavy infection (worm estimate = 1215) 120 mgs. of the drug (10 to 12 mgs. per kilo) administered per diem reduced the worms 25·10 per cent. in 30 days (total dose 3600 mgs.) and 36·60 per cent. in 45 days (total dose 5400 mgs.) : accordingly, it was concluded that :—

" 1. The oral administration of gentian violet is effective against clonorchiasis.

" 2. The clonorchicidal value of gentian violet is more marked in light cases than in heavy infection.

" 3. The clonorchicidal value of gentian violet increases proportionally with the doses administered.

" 4. Wakeshima's egg counting method is the best and the most reliable one for the judgment of clonorchicidal effects of drugs." *C. L.*

GALLIARD (Henri) & PHAN-HUY-QUAT. Recherches et considérations sur le traitement de la distomatose hépatique à *Clonorchis sinensis.* [**The Treatment of** *Clonorchis sinensis.*]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Oct. Vol. 14. No. 8. pp. 1094–1110. [21 refs.]

The literature is surveyed and a report given of, it seems, three cases treated with a course of 15 to 20 intramuscular injections of anthiomaline beginning with 3 centigrams and increasing the amount by 3 centigrams at each injection. In two cases pains and ascites disappeared, in the third the number of eggs lessened. *C. L.*

ZOTTA (G.), RADACOVICI (E.) & DIMITRIU (O.). Un cas de distomatose humaine à *Fasciola hepatica.* [**Human Infection with** *F. hepatica.*]—*C. R. Soc. Biol.* 1937. Vol. 125. No. 14. p. 82.

A well-attested case of infection of man by *F. hepatica* in Rumania. The eggs were typical and were found not only in the faeces but also by the duodenal sound. The patient complained of pain over the gall bladder radiating upwards, nausea, vomiting, and had an eosinophilia of 9 per cent. *C. L.*

Diss (A.). Biologie de *Fasciola hepatica* L. dans une localisation aberrante. [**The Biology of *F. hepatica* in an Abnormal Habitat.**]—*C. R. Soc. Biol.* 1937. Vol. 125. No. 15. pp. 157–158.

A subcutaneous infra-mammary tumour removed in Marseilles from a woman of 60 had this fluke within it. The state of the surrounding tissues is described. *C. L.*

Erratum.

Vol. 34, No. 5, p. 398, Penso's summary on the action of calcium cyanamide on cercariae, the penultimate sentence should read "With *Cercaria burti* [solutions of calcium cyanamide in strengths of] 2 per thousand killed all in 3 minutes and 1 *per thousand* in 5 minutes."

Tomita (S.). **Clinical Observations on Patients infested with *Hymenolepis nana*, with Special Reference to Changes in their Blood Pictures.**—*Taiwan Igakki Zasshi* (*Jl. Med. Assoc. Formosa*). 1937. May. Vol. 36. No. 5 (386). [In Japanese, pp. 1043–1055. With 1 chart. [16 refs.] English summary p. 1056.]

The report covers 50 patients (44 Aborigines and 6 Japanese or Formosan Chinese) with *H. nana* infection.

In nearly all there was anaemia, mostly due to lessened haemoglobin rather than to fewer red cells, in 18 some leucocytosis, in 38 eosinophilia (with, in 35, a neutropenia), in 23 lymphocytosis. When these changes were marked there was "diarrhoea, constipation, hunger pains, bodily fatigue, slight pyrexia, palidity of face, anorexia, headache, melancholia, palpitations, vertigo, insomnia, convulsions, night talks, nocturnal enuresis, etc." The English abstract has no mention of the presence or absence of other parasites. *C. L.*

Barnett (Louis). **Hydatid Disease. Prevalence and Prevention.**—*New Zealand Med. Jl.* 1937. Apr. Vol. 36. No. 192. pp. 105–117. [12 refs.]

The present educational campaign in New Zealand of persuasion, while likely to lessen the incidence of hydatid infection in man, is unlikely to approach eradication. Compulsion is necessary.

After noting the seriousness to man and sheep of hydatid infection in New Zealand [this *Bulletin*, 1937, Vol. 34, p. 21], it is pointed out that the dog population is about 150,000, about a fifth being town dogs not fed on raw offal and almost without infection, while in the country about 40,000 carry this tapeworm. Of the persuasive methods the most important are posters and folders, both highly thought of outside New Zealand; but as to the folders "It has been reported to us that our leaflets are not only left unread, but sometimes are condemned to ignoble use." What farmers most object to is the advice to bring to the boil sheep's offal before feeding them to their dogs. It is urged that the feeding of unsterilized offal to dogs, and the regular giving to them of arecoline every two or three months, should be a matter of law; elsewhere, however, the statement occurs that, though the notification of hydatid disease in man is insisted on by law, the law is constantly ignored by medical men. Since the infection has no noticeable ill-effect on wool or mutton the farmer has no particular incentive to keep his sheep clean of parasites. But

the meat freezing companies kill about 12 million sheep a year and the livers of 4 million are condemned as unfit for food ; this, at 3*d.* a liver, is a loss of £50,000 a year ; and if these companies would deduct a few pence for each carcass with hydatid the farmer would " sit up and take notice." Moreover, Germany refuses carcasses without livers, which amounts to exclusion of New Zealand mutton, and the British market is nearly saturated. If the Government is ready for compulsion, the committee of the Medical School at Otago has ready a complete scheme. *C. L.*

Penfold (H. Boyd). **The Signs and Symptoms of** *Taenia saginata* **Infestation.**—*Med. Jl. Australia.* 1937. Apr. 10. 24th Year. Vol. 1. No. 15. pp. 531–535. [10 refs.]

Of 100 consecutive patients, tapeworm segments in the stools were seen by 98, in the underclothing by 93 ; in 2 they were vomited, once after an anaesthetic, once during pneumonia. Pain was present in 47 with very variable characters and in at least 4 it had a typical duodenal ulcer character, with no evidence of ulcer to X-rays and it disappeared for good with expulsion of the worm ; in 2, gall stone colic was simulated and it, too, disappeared when the worm was passed. In one, an experienced practitioner removed the appendix for pain, segments being seen in the stool next day. Acute abdominal tenderness was present in two neurotics. Giddiness was present in 37, appetite and weight were not noticeably altered. Of 20 patients examined for blood change, there was a lymphocytosis of 33 to 59 per cent. in 16, and an eosinophilia of 6 and 13 per cent. in two. *C. L.*

Palais (M.). Développement de *Taenia saginata* G., dans les cas de parasitisme multiple. [**Development of** *T. saginata* **when more than One is present.**]—*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 485–490.

Two cases are described, one with 3, and one with 19 worms, the scolex being passed in 14, the neck being present in the others. When numbers are large, there is a lessening of length and of numbers of segments, and the development of the genitalia takes place nearer the head than was held normal by Sommer in 1874, but this difference is not accompanied by any anomalies of shape.

The segments are classed in 29 grades, that at which eggs first appear in the uteri being xx, and atrophy of the genitalia beginning in grade xxvii. Grade xx was not reached at all in 5 of the 14 complete worms, but in the others it was present variously from segment 444 to segment 562 [mean 489]. *C. L.*

Penfold (H. Boyd). **The Life History of** *Cysticercus bovis* **in the Tissues of the Ox.**—*Med. Jl. Australia.* 1937. Apr. 17. 24th Year. Vol. 1. No. 16. pp. 579–583. With 17 figs. on 4 plates.

The life span of *Cysticercus bovis* in the ox varies greatly even in the same host ; most are dead in 4, all in 9 months, and the age of any one cannot be estimated from its appearance when it is more than 6 to 8 weeks old. As they degenerate their size lessens and by about two years there is commonly complete disappearance, or at most a small fibrous scar is left. While growth is going on, the cyst at 2 to 4 weeks old has a minute embryo and yellow creamy contents, at

4 to 8 weeks there is growth of the embryo and the contents of the cyst are pasty yellowish green, at 1½ to 9 months there is a complete bladder worm growing in size and strength. All cysts do not go through these stages, for degeneration may begin at 6 weeks. It, too, is described as having three stages; the first is evidently short-lived, for it is seldom seen, the cyst becomes opaque and white and its contents jelly-like; the second is found in from 6 weeks to 5 months and in it the embryo has gone and the cyst contents are bright green from calcareous corpuscles recognizable microscopically; the third stage is seen in cysts 7 or more months old, 1 to 5 mm. across, filled with a dry, dirty-yellow mass, which breaks up grittily between finger and thumb. *C. L.*

Moorthy (V. N.). **A Simple Method of staining and mounting Nematode Larvae.**—*Jl. Parasitology*. 1937. Feb. Vol. 23. No. 1. pp. 100–102.

The method is in essence one for the release, fixing, staining and preservation of guineaworm larvae in cyclops. Release is easiest if the cyclops is dead and the larvae within it still alive, and this condition takes place when the cyclops is brought into a solution of mercuric chloride 0·52, sodium chloride 1·04, distilled water 100; for in it cyclops dies within 2 minutes and guineaworm larvae in over 20 minutes. The note gives full details of the procedure advised.

C. L.

Gunawardana (Samson A.). **Intestinal Worm Survey in 200 Post-Mortem Examinations at the General Hospital, Colombo.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.) 1937. Feb. 10. Vol. 4. Pt. 3. pp. 153–162.

Of these ten pages, full of detail, whose scope the title shows, an adequate abstract seems impossible.

The method was to remove the small and large intestine (not the rectum) and, after taking a sample of faeces from the lower end for a Stoll-Hausheer count, to wash the contents into a vessel, pass this through a sieve with 3,000 meshes to the square inch, open the intestine, and pick out the worms which remained. In this way there were got these numbers—males, females and totals respectively—hookworms 12,124, 14,022, 26,146; ascaris 249, 352, 601; trichuris 1,776, 2,182, 3,958. Enterobius females were found in 61, males in 7, the highest numbers being 643 and 15 respectively. Of the other worms, hookworm average numbers per person increased with age in the first 5 decades from 45·9 to 227, those in the sixth and seventh decades being 93·7 and 207; for ascaris the mean numbers did not vary significantly, though they were highest (5) in the sixth decade. The highest numbers of hookworms were 2,491, of ascaris 54, of trichuris 729. As to the relation of the weight of infection to the disease which caused death, the number of hookworms in two who died of this infection averaged 1,287; other significant average numbers seem to be, for phthisis 203·7, for nephritis 204·8, and chronic circulatory disease 139·2, and at the other end of the scale 16 in chronic gastro-intestinal disease. In only 17 persons were no hookworms seen, the corresponding numbers for ascaris and trichuris were 107 and 37. The average numbers of hookworms in persons from "sanitated" and "unsanitated" areas were 62·2 and 165·7, those of ascaris being 2·1 and

2·7 and of trichuris 14·7 and 22·2. Only one body had no worms. That there was no relationship between egg counts and hookworm loads Gunawardana's evidence is very clear.

Thus for the seven decades the average hookworm load to the nearest whole number, and the average egg count in hundreds were 46 and 33, 82 and 31, 97 and 38, 139 and 39, 227 and 49, 94 and 31, 207 and 78; while as to particular instances there were 158 females with 78,900 eggs per cc., 1,302 females with 61,600 eggs and 1,457 females with 41,200 eggs per cc.; these with all other egg counts being reduced to the " basis formed faeces." The author points out that his experience in this respect accords with that of Maplestone and Mukerji (this *Bulletin*, 1936, Vol. 33, p. 117) and it is worth repeating " there is no correlation between ova counts and the number of worms present." *C. L.*

Konus (E. M.) & Jakoubovitch (S. A.). Réactions cutanées d'après Fülleborn comme méthode de diagnostic de l'ascaridose chez les enfants préscolaires. [**The Cutaneous Test of Fülleborn in Diagnosis of Ascaris Infection in Children.**]—*Med. Parasit & Parasitic Dis.* 1937. Vol. 6. No. 1. [In Russian pp. 107–114. French summary pp. 114–115.]

The authors tested 70 pre-school children for reaction to ascaris antigen—the dried powder prepared in accordance with Fülleborn's method. In 68·5 per cent. (presumably 48 of the children) the reaction was in accordance with the presence or absence of infestation. In 13 the reaction was positive although no ascaris were recovered by anthelmintic treatment. In 12 a second treatment produced the worm so that in one only did the positive persist without proof of the presence of worms. *H. H. S.*

i. Winfield (Gerald F.) **Studies on the Control of Fecal-borne Diseases in North China. II. The Distribution of *Ascaris lumbricoides* Infestations in a Rural Population.**—*Chinese Med. Jl.* 1937. Apr. Vol. 51. No. 4. pp. 502–518. With 2 graphs. [20 refs.]

ii. ——. **Studies on the Control of Fecal-borne Diseases in North China. III. Family Environmental Factors affecting the Spread of *Ascaris lumbricoides* in a Rural Population.**—*Ibid.* May. No. 5. pp. 643–658. With 1 fig.

i. " This is the first of two papers reporting the results of a detailed study of the epidemiology of *Ascaris lumbricoides* in a group of West Shantung Villages. Of the 1,190 persons examined, 81 per cent. were positive for ascaris, 0·2 per cent. harboured trichuris, while no hookworms were found. The entire series had an average corrected (to Porto Rico Standard Population) ascaris egg count of 14,000 eggs per cc. The counts of the children were slightly more than twice as great as those of the adults, while the females had larger counts than the males in each age group from 10–19 on. This series of examinations differs from those made in other parts of the world in that the percentage of heavy cases is smaller than usual while the number of medium and light cases is greater. This points to the fact that the life habits of the people of these villages are favourable for the spread of ascaris, while the general climatic conditions tend to hold the infection in check. The effect of a dry climate in reducing parasitism in this area is indicated by comparisons with the results of a similar study carried out by Cort and Stoll in East Shantung, where a slightly larger and more evenly distributed rainfall coupled with lower

temperatures, permits the more frequent occurrence of ascaris, trichuris and hookworms."

ii. "This paper reports the results of environmental studies in 83 families that are typical of west Shantung rural conditions. Thirty-five of these families were lightly infested with ascaris, while 48 were heavily infested. Isolations from soil samples demonstrated that ascaris eggs were widely distributed within the courtyards, rooms and streets of the villages. The number of eggs isolated from the heavy families was about twice that from the light ones. This difference in the number of eggs in the soil of the household [*sic*, ? houseyard] seems to be the chief explanation of the difference in worm burden since the water supply and source of fresh vegetables for these two groups of families were identical. The defecation habits of the pre-school children is [*sic*] the chief factor in building up and maintaining the heavy soil infestation within the household. The pen-latrine is an additional source of infection, with eggs being tracked from it into the household by people and animals and carried by chickens. Methods of emptying the pen-latrines and handling fertilizers also contribute to the pollution of the household and village. The scavenger dogs aid in the dissemination of viable ascaris eggs within the village. The food and personal habits of the villagers amply explain how the eggs may be ingested. The lightly infested families have fewer children and are economically better off than are the heavy families. The conditions revealed by this study not only permit the transmission of ascaris, but also contribute to the spread of other fecal-borne diseases."

[A pen-latrine is a place where the family faeces serve as food and as a wallow for the family pig, which then tracks about the family yard.] *C. L.*

Zatourenskaya (B.) & Vichnevskaya (S.). Sur l'action de certains facteurs chimiques et physiques sur les oeufs d'*Ascaris lumbricoides*. [**The Action of Certain Chemical and Physical Factors on Ova of** *Ascaris lumbricoides*.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 5. [In Russian, pp. 675–678. With 1 fig. French summary p. 679.]

Chloride of lime up to 30 per cent. acting on ova of *A. lumbricoides* kept in a moist chamber at 25°C. prevents evolution to the larval stage in only 50 per cent. ; at 50 per cent. strength of lime they are killed. Concentrated HCl kills them or causes arrest of development in the 2–4 blastomere stage. Clearly, chloride of lime cannot be relied upon to destroy helminth ova in faeces exposed to the air. Drying on a thin layer is fatal to ova in the first stage, when embryonated they die more rapidly under drying than with subjection to 50 per cent. chloride of lime. *H. H. S.*

Lapage (Geoffrey). **The Effects of Some Natural Factors on the Second Ecdysis of Nematode Infective Larvae.**—Reprinted from *Univ. Cambridge Inst. Animal Path. Fourth Rep. 1934–35*. 25 pp. [30 refs.] 1937. Imperial Bureau of Agricultural Parasitology. Winches Farm Drive, Hatfield Road, St. Albans. [4*s*.]

These experiments were carried out on nematode larvae which do not enter the definitive host by the skin.

In these circumstances the second ecdysis is not caused merely by change of temperature or by the pH of the environment, but these changes may so alter the sheaths that osmosis may bring about an ecdysis in which inorganic salts play a notable part, and this part may be varied by normal or abnormal changes in the contents of different parts of the alimentary canal and may perhaps determine immunity,

host restriction and host resistance. The sheaths on larvae long on pastures may get brittle and easily broken but this is not true ecdysis. Indeed in nature mechanical damage or friction does not cause true ecdysis. The boring movements of larvae which do not penetrate the skin are perhaps relics dating from the time their ancestors did so. The larvae concerned were those of *Haemonchus contortus*, *Ostertagia circumcincta* and *Trichostrongylus species*. *C. L.*

Diehl (Friedrich) & Schwoerer (Paul). Allergie der menschlichen Haut gegen *Ascaris lumbricoides*. [**Intracutaneous Reaction of Man to Ascaris Antigen.**]—*Arch. f. Experim. Path. u. Pharm.* 1936. Oct. 20. Vol. 183. No. 1. pp. 1–8. [10 refs.]

The object of the investigation was a three-fold test of sensibility to ascaris antigen : a general test of sensibility as measured by the greatest dilution in which it gave a reaction ; one of the sensibility of infected, as compared with non-infected ; one to determine whether those with allergic symptoms (two had urticaria, the others asthma), were more sensitive to this antigen than were those who had not.

Many ascaris were used to make the antigen, which consisted mainly of the body fluid of worms placed in Ringer's solution and filtered, the fluid then heated and filtered twice to get rid of protein ; it was then a nut brown, sterile fluid with the ascaris smell even when much diluted ; about 0·05 cc. was used to impregnate the skin of the back, and the result was held positive if the wheal attained a considerable size [sich deutlich vergrosserte] and showed a red halo. The first injection was generally with one part in a hundred million, the following ones with a tenfold increase of strength till a positive reaction was obtained.

The percentages of positive reactions were as seen in the Table :—

Dilution of antigen	Not allergic	Those with allergic illness	Not infected with ascaris	Ascaris infected
1 in 100,000,000 ...	1·6	4·4	1·9	0
,, 10,000,000 ...	3·6	14·3	6·9	4·1
,, 1,000,000 ...	18·0	28·6	20·9	15·8
,, 100,000 ...	28·5	47·5	34·6	21·2
,, 10,000	48·4	61·3	49·4	41·9
,, 1,000	78·4	78·6	76·4	80·6
,, 100	90·5	96·2	91·4	95·6
,, 10	99·2	100·0	98·7	100·0
,, 1	100·0	100·0	100·0	100·0

C. L.

Bachman (George W.), Rodríguez Molina (Rafael), Hoffman (W. A.) & González (José Oliver). **A Study of Parasite Control in Puerto Rico over a Period of Five and a Half Years.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. June. Vol. 12. No. 4. pp. 369–388. With 10 charts. [20 refs.] [Spanish version pp. 389–404.]

Examinations of 188 persons were carried out eight times during 5½ years, using on each occasion 0·02 gm. of faeces, diluted in decinormal caustic soda solution.

Two anthelmintic treatments were given during the first two years consisting of a mixture of carbon tetrachloride and oil of chenopodium in the proportion of 11 to 4, the dose being 0·6 cc. at 3 years with an increase of 0·2 cc. for each year of age so that it reached 3 cc. at 15 years, which dose was not increased for any age. All were treated in hospital. There were also educational and sanitary campaigns, with talks on body and home hygiene, cinemas, and demonstrations ; and house-to-house visits by social workers during part of the time. These plantation workers lived in more or less substantial frame houses, each with a latrine, the houses scattered and separated, with heavy vegetation round them.

Anaemia, present in the author's view when the haemoglobin was below 70 per cent. to the Sahli haemoglobinometer (which takes 14·5 gm. as 100), was found in 68 per cent. of those examined, particularly among children. Malaria is endemic here. Of 40 soil samples from the yards of houses, only 4 were positive for hookworm larvae ; of 20 taken near houses, 11 were thus positive, while from nearby sugar cane fields the percentage of infected specimens was high. Hookworm infection fell after two treatments from a percentage, to this technique, of 70, to one of 0·6, remained below 20 while there was supervision, rising rapidly as soon as it ceased, being 68 at the end ; the mean egg counts at the beginning were 6,787 and at the end 5,029 to the gram. Ascaris incidence fell from 61 to 7 per cent., rose rapidly to 67 even though the vigilance of the campaign continued, dropped to 46 and ended at 50 ; and, this in spite of all houses having latrines and of the stress laid on this point by " prevailing opinion," as the essential step in the prevention of this infection. Trichuris infection worsened during the period ; it started with a percentage of 80, fell to 55, and in the last 19 months remained about 90. *C. L.*

League of Nations. Health Organisation. Inter-Governmental Conference of Far-Eastern Countries on Rural Hygiene. Preparatory Papers Relating to British India. Ser. L.o.N.P. 1937. III. 6. pp. 92–98.—**Hookworm Infection in India.**

Some 210,000,000 persons in India have, it is estimated, this infection, but it is held that the average intensity of infection is low compared with Porto Rico, Central America and China. Though soil pollution is unusual, faeces are rarely used as a fertilizer. The heavy infections among estate coolies are probably due to aggregration of population when, for purposes of cultivation, the rainfall is high. Necator infection predominant in south and east India [it is the only infection about Darjeeling in the Himalayan foothills] is more and more displaced by ancylostoma as one passes west and north. The incidence of hookworm is given for various parts of India, but whether the diagnostic techniques used were of equal accuracy in all instances, is not noted. Hookworm infection as a public health problem is faced squarely. There is none of the suggestion, too often apparent, that all that can be done at the moment is all for which good hygiene calls.

" Whatever views may be held as to the effect of small numbers of hookworms on the health of the persons concerned, questions of emphasis and expense would undoubtedly remove the hookworm problem from immediate public health consideration over the greater part of India . . . . As has been amply demonstrated in many places, the provision of latrines is a corner-stone in the control of hookworm infection without which

little progress can be made, and it is becoming more evident that public latrines are as a rule not adequate for this purpose. On the scores of expense, utility, safety and general adaptability, the bore-hole latrine would seem to be the best type to adopt, in areas where the soil is suitable, as a household latrine."

[It is clearly felt that the dropping of faeces directly into the subsoil water is a smaller risk to public health than is constituted by hookworm infection—a tribute to the harm done by the latter. It will be remembered that in Tonga these latrines are " an excellent breeding ground for cockroaches " (this *Bulletin*, 1937, Vol. 34, p. 432).]

C. L.

CUMMING (Hugh S.). Sur l'ankylostomiase aux Etats-Unis. [**Ankylostomiasis in the U.S.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Apr. Vol. 29. No. 4. pp. 748–751. [10 refs.]

A record of the literature leads to the conclusion that in the United States hookworm infection in mines is not a grave problem while on the surface, it is so in the Southern States. *C. L.*

SMITH (W. H. Y.), MCALPINE (James G.) & GILL (D. G.). **Intestinal Parasite Survey in Alabama. I. A Comparative Study of Two Hookworm Anthelmintics.**—*Amer. Jl. Public. Health.* 1937. May. Vol. 27. No. 5. pp. 471–475. With 1 map and 1 chart. [10 refs.]

For examination of faeces " the Caldwell technique was used rather than the Stoll." Of 14,622 specimens, 32·3 per cent. were positive when 0·01 gram was so examined, the Rockefeller Commission of 1914 [which often used much more faeces, at least in other countries] had found 53·6 per cent. positive. Treatment was by: (1) Carbon tetrachloride 2, Ol. chenopodii 1, given in a dose of 3 minims per year of age with a maximum of ℥ 30; (2) tetrachlorethylene 0·2 cc. per year of age (maximum 3 cc.), odd numbers being given one treatment and even numbers the other. When some 800 in each category were re-examined 10 to 14 days later those found positive were 9·4 and 26·3 per cent. respectively. The infection was markedly lower in coloured than in white persons. *C. L.*

ESPIÉ (A.). L'ankylostomiase en Tunisie dans les terrains cultivés et les campagnes. [**Ankylostomiasis in Cultivated Land and Open Country in Tunisia.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Apr. Vol. 29. No. 4. pp. 778–783.

" *Ankylostomum duodenale*," identified by its eggs, is present in marshy insanitary spots in South Tunisia.

In 300 faeces from inhabitants of Gabè these eggs were found by an unstated method in 82 (27·33 per cent.). With these eggs there were others: Ascaris 5 times, trichuris 8, ascaris and trichuris 64, *H. nana* and trichuris 1, ascaris, trichuris and " a strongylus " 4. In Gafsa, in 200 faecal examinations there were " *Ankylostomum duodenale* " alone 1, with ascaris 4, with trichuris 6, with ascaris and trichuris 35, with trichuris and " a strongylus " 1, with ascaris, trichuris and " a strongylus " 2, with the first two and strongyloides 1, and with these two and *H. nana* 1. *C. L.*

VILLEJEAN (A.). L'ankylostomiase dans les mines en France. [**Ankylostomiasis in French Mines.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Apr. Vol. 29. No. 4. pp. 752–777.

A survey of the literature concludes with the statement that ankylostomiasis has practically disappeared from most mines; some are slightly infected, but anaemia has practically gone. Still, there should be maintained examination of miners on enlistment and thereafter periodically, with treatment of those notably infected.

C. L.

FIKRI (M. Mahfouz) & GHALIOUNGUI (Paul). **Ancylostoma Anaemia.**—*Lancet.* 1937. Apr. 3. pp. 800–802. With 2 charts. [12 refs.]

The blood volume was estimated by an injection, during one minute exactly, of a solution of Congo red, as advised by TODD and SANDFORD, and the drawing off of blood 2½ minutes after the end of the injection; the haematocrit reading and the colour of the blood plasma were then noted. It is concluded that so far from there being an increase in blood volume, there is a lessening due to the decreased volume of red cells. [The conclusion depends on the inference that the reticulo-endothelial system does not remove injected dyes from the blood within 2½ minutes.]

"The glucose tolerance of 18 cases of pure ancylostoma infestation has been investigated. In 12 there was some abnormality in the extent of the hyperglycaemic response, its duration or its fall. In 9 of these two or more defects were associated.

"The blood-sugar curves after intravenous injection of glucose were determined in 8 cases. They were normal and did not correspond to the respective oral responses.

"Interference with absorption caused in some way by the presence of the ancylostoma worms and by their bites in the duodenum is surmised as an explanation." *C. L.*

VILLELA (Gilberto G.) & TEIXEIRA (J. Castro). **Blood Chemistry in Hookworm Anemia.**—*Jl. Lab. & Clin. Med.* 1937. Mar. Vol. 22. No. 6. pp. 567–572. With 1 chart. [23 refs.]

In hookworm anaemia with oedema, low values for plasma proteins are frequently found.

The normal values for plasma proteins are put by various workers as being from 7 to 8·8 g. per 100 cc. Apparently the authors' normal average worked out at 7·82, with albumin 5·1 and globulin 2·4. In five persons with hookworm anaemia and with haemoglobin between 32 and 66 (mean 55) there was no oedema, the mean protein was 7·2 and the mean albumin 4·5; in 9 such with haemoglobin between 20 and 70 (mean 35·7) there was oedema, the mean protein was 6·34 and the mean albumin 3·7. The conditions bringing on oedema are the constant drain of proteins by loss of blood coupled with under-nutrition, that is, with the intake of insufficient protein to make good the loss. *C. L.*

Egypt, Ministry of Public Health: The Research Institute and the Endemic Diseases Hospital. Fourth Annual Report 1934 [Khalil (M.)].—**The Toxicity of Carbon Tetrachloride CCl_4.** pp. 4–7.

Notes on a death 6 days after taking a mixture of 0·5 cc. of carbon tetrachloride with 0·5 cc. of oil of chenopodium given for ascaris infection, to a male child of 7 years, weighing 22 kilos.

At autopsy two ascarids were coming out through the nose, there were about 40 in the stomach, and clumps of them 10 inches above the ileo-caecal valve with "definite partial obstruction," congestion and petechial harmorrhages. "The duodenum was found normal, no ancylostoma worms were found," though of their absence from their more usual sites there is no mention. "No other abnormality could be seen in the intestines. The liver was slightly enlarged and fatty. The spleen was normal in size. The kidney capsule [was] easily taken off, and [there were] no signs of nephritis. Histological studies of this case will be reported in the clinical and pathological section" [? of some other publication]. *C. L.*

Schwartz (Benjamin) & Porter (Dale A.). **Tests with Hydrogen Peroxide as an Anthelmintic.**—*Rev. Med. Trop. y Parasit.* Habana. 1937. Jan.–Feb. Vol. 3. No. 1. pp. 11–24.

The tests were carried out on white rats and on dogs.

The experiments were undertaken *in vivo* from the conviction that "no reliable conclusions regarding anthelminthic efficacy can be drawn from tests *in vitro*." In rats the infection was one with *Nippostrongylus muris* 6 to 8 days old, the drug was given through a catheter passed down the throat as far as possible under light anaesthesia and the rats faeces were examined during their life and the intestines after they had been killed. The rats weighed about 150 grams and were given 3 to 4 cc. of a 0·5 to 1·5 per cent. solution of hydrogen peroxide. After a 0·5 per cent. solution the percentages of worms passed compared with the total recovery were 1·8 to 2·1; after a 1 per cent. solution, 45·5 from 3 cc. and 60·8 and 63·3 from 4 cc.; after a 1·5 per cent. solution, 51·5 to 93·3 from 4 cc. Three pups, 32 days old, weighing about 2 kilos, were given two treatments of 2 oz. [say 60 cc.] each of a 1·5 per cent. solution, and passed, of the *Toxocara canis* they harboured, 85·7, 90 and 100 per cent., and of *Ancylostoma caninum* 0, 37·5 and 50 per cent.; their three litter mates, at 46 days old, were given one such treatment and passed, of *T. canis* 64·8, 94·1, and 100 per cent., and of *A. caninum* 33·3, 42·9 and 100 per cent. To three full grown dogs of 6·2 to 8·4 kilos were given 2 oz. of the 1·5 per cent. solution once; the percentage efficacy for *A. caninum* was 0, for *T. canis* 100, for *Toxascaris leonina* 16·7 and 83·3, for *Dipylidium caninum* 0 and 0.

[Seeing that a 3 per cent. solution of H_2O_2 evolves ten times its volume of O_2, it will be realized that if the weaker solutions used here were given to man weight for weight, the figures got from the rats would mean for him a dose of from 400 to 1,600 cc. of water, with a prompt escape of 666 to 8,000 cc. of oxygen into stomach or duodenum, or both; from the younger puppies the comparative figures for man would be 1,800 cc. of fluid and 9,000 cc. of evolved oxygen, a total of nearly 11 litres of suddenly added contents.] *C. L.*

Arreza-Guzman (A.). Recherches expérimentales sur le traitement de la strongyloidose murine. [**Experimental Work on the Treatment of Strongyloides in Rats.**]—*Ann. Parasit. Humaine et Comparée.* 1937. Mar. 1. Vol. 15. No. 2. pp. 125–145. [30 refs.]

Rats infected with "*Strongyloides ratti*" were treated with pyrethrines, gentian violet, thymol, oil of chenopodium, tetrachlorethylene, and glycerine, and the worms were not killed off though the rats were. Even when these drugs killed the host, the intestine still contained large numbers of living strongyloides; the cure is still to seek. Again when there were added to 5 cc. of Ringer's solution washed strongyloides and two drops of a 1 in 1,000 alcoholic solution of thymol or two drops of oil of chenopodium the lethal action was definite, with tetrachlorethylene this was doubtful and with methyl violet and the pyrethrines there was none. Here, it is claimed, is a simple and exact method for testing the efficacy of new drugs. [This important claim, it is here suggested, is not good. As these very experiments show, results from *in vitro* tests cannot be transferred to conditions *in vivo*; thus thymol after absorption into man's body is excreted as a glycuronate; it has been changed in the body and the analogy with some other drugs suggests that it is some substance which comes into being during such change which is the true anthelmintic. Nor can *in vivo* experiment in one animal be taken unhesitatingly as evidence for what happens in another, since such an anthelmintic substance as may be formed by physiologico-chemical changes in one animal will not necessarily be formed in another; for if the physiological chemistry of all animals were alike there would not be that marked restriction of particular parasites to particular hosts which there is. The results of anthelmintic experiments, whether of those *in vitro* or of those *in vivo* on animals other than man, may be taken only with hesitation as being certainly true for man.] *C. L.*

Hinman (E. Harold). **A Study of Eighty-Five Cases of *Strongyloides stercoralis* Infection, with Special Reference to Abdominal Pain.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 531–538.

"An analysis of 85 cases of *Strongyloides stercoralis* infection is presented. Diagnosis was proved in each case by stool examination. Among etiological factors studied it was found that there was a marked predominance in the male sex, in the white race, and in the second, third and fourth decades of life. Seasonal distribution and occupation appear to be of some significance. The most frequent presenting complaint was abdominal pain. Diarrhoea was less common. The history revealed that in addition to abdominal distress and diarrhoea, nausea and vomiting, headache, anorexia, loss of weight, weakness, malaise, constipation, distension and flatulence were frequent symptoms. Physical examination revealed localised abdominal tenderness in 34·1 per cent. of the cases. Fever above 101°F. was infrequent. Laboratory studies showed three of the thirteen cases with hypochlorhydria, a moderate secondary anemia, rarely leucocytosis, and an average of 8·6 per cent. eosinophils in forty-seven cases. The diagnosis of *Strongyloides* infection must be considered in all cases presenting abdominal distress, vague dyspepsia, diarrhoea or eosinophilia. Stool examination in most cases will readily exclude this condition." *C. L.*

Bruns (Hayo). Ueber *Anguillula (Strongyloides) intestinalis.*—*Ztschr. f. Hyg. u. Infektionskr.* 1937. Feb. 18. Vol. 119. No. 3. pp. 336–351. [21 refs.]

Ross (I. Clunies). **Infestation of Man with *Trichostrongylus colubriformis* from Sheep.**—*Med. Jl. Australia.* 1937. Jan. 23. 24th Year. Vol. 1. No. 4. pp. 122–123.

The actual experiment is concerned with the transference of this infection from man to sheep.

"Two laboratory attendants at the McMaster Animal Health Laboratory, who were associated with experimental work on the small Trichostrongyles of sheep which necessitated the frequent handling of infective *Trichostrongylus* spp. larvae, were both found to be passing strongylid eggs in their faeces. On culture, *Trichostrongylus spp.* larvae were recovered."

Two lambs were taken on the day of their birth, reared in cages, fed on cow's milk and examined by D.C.F. 3 times a week for 3 weeks with no finding of eggs. To one there were then given 210 infective trichostrongylus larvae from eggs derived from the faeces of one of the attendants. The amount of faeces examined at a time was 8 grams and in this quantity the number of trichostrongylus eggs found was 2 on day 18, 8 on day 19, 250 three days later and 400 a week later. It was killed on day 26, minutely examined and 5 male and 12 female *T. colubriformis* found in the small intestine. The faeces of the control lamb, examined in the same way, were free from eggs a fortnight later. "There appears to be little doubt in this case that the infestation in man was brought about with *Trichostrongylus colubriformis* of ovine origin." *C. L.*

Hall (Maurice C.). **Studies on Oxyuriasis. I. Types of Anal Swabs and Scrapers, with a Description of an Improved Type of Swab.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 445–453. With 1 fig.

The swab which has best come through Hall's tests for the detection of threadworm infection is a glass rod round whose point is wrapped a square of "Cellophane" and whose butt perforates a rubber cork, which in turn is fitted into the mouth of a test tube for clean and safe carriage.

The ideal swab "should pick up pinworm [enterobius] eggs, when these are present, quite dependably; should deliver them to a microscope slide dependably, with the minimum amount of manipulation that involves dilution or possible loss of eggs from any cause; should be easy to transport with no loss of eggs and with safety to persons handling the swab; and should cause the patient little or no inconvenience in its use. For research it is desirable to be able to control the moisture factor and so maintain the viability of the eggs." Absorbent cotton swabs did not release all eggs on the slide, chamois leather was not suitable for the swabbing movement needed. Rayon fabric let eggs through. Celluloid scrapers 4·5 cm. long by 1 cm. were effective, but might lose eggs in transport. The "Cellophane" swab

was made by folding a 3 cm. square of "Cellophane" in two equal rectangles, placing

"..... a glass rod about 8 to 10 cm. long by 4 mm. wide, with rounded ends, between the halves of the folded square and at right angles to the fold about one-third of the distance from one end of the fold, folding down the short end diagonally and wrapping it about the rod, then folding down the long end diagonally and wrapping it about the short end and the rod, and fastening the folded cellophane to the rod with a small rubber band. The rod was first pushed through a perforated rubber cork of a size suitable for corking a test tube. This combination of cellophane, glass rod, rubber cork and test tube constituted a simple set-up which met several requirements for a satisfactory swab for large-scale operations. The swab was used dry and pinworm eggs adhered to it or were scraped into the folds over the tip, so it acts both as a swab and a scraper. To make the examination for eggs, the cellophane was pushed forward over the tip of the glass rod for a short distance, and the cellophane tip which had been used for swabbing was cut off beyond the rod tip with a pair of fine scissors, the tip being held at the time in a mixture of decinormal sodium hydroxide and stain; the cellophane tip was then flattened out with the rod and a pair of forceps, a couple of drops of additional sodium hydroxide put on the cellophane, and the preparation covered with a cover glass. The eggs adhering to the cellophane or released under it were readily found by microscopic examination through the thin transparent cellophane, and no separation of the eggs from the contact part of the swab by any form of manipulation is needed with this type of swab, contrary to what is true for other types."

The stain came into use because the blue dye in the rayon used was not fast and stained the enterobius eggs and embryo conspicuously and selectively. Attempts to identify the dye have hitherto been unsuccessful. The appearance of these eggs outside the anus is irregular in infected persons; in groups examined four times the percentage of positives displayed by the first and by the total of four examinations were 12·5 and 87·5, 15 and 64·4, 10 and 52. The number of eggs on a swab has no correlation with the number of threadworms present. The swab is designated the NIH swab. *C. L.*

Battaglia (Alberto) & Di Fiore (Honesto). Apendicitis a oxiurus. [**Enterobius Infestation and Appendicitis.**]—*Prensa Med. Argentina.* 1937. July 7. Vol. 24. No. 27. pp. 1349–1359. [48 refs.]

The authors, having recently observed three children with appendicitis associated with the presence of Enterobius, thought it would be interesting to review the operations for appendicectomy performed at their clinic during the past two and a half years. They preface their remarks by references to the literature on the subject. They have investigated 542 clinical histories and found that in 11, or 2 per cent., Enterobius was found in the extirpated appendix. Of the total, 5 were among 405 patients under 15 years of age (1·2 per cent), and 6 among the remaining 137 over 15 years (4·3 per cent.). Nine of the eleven suffered from symptoms of chronic appendicitis, one of them with acute exacerbations from time to time, the other two suffered from acute appendicitis (children of 11 and 12 years of age). Their own three cases were somewhat unusual; eosinophilia was not marked, 4, 5 and 8 per cent. respectively, ova were not found in the faeces nor in the lumen of the appendix, although the worms were many, 29, 62 and 83 respectively, and the majority were females. *H. H. S.*

i. Hall (Maurice C.) & Collins (Benjamin J.). **Studies on Trichinosis. I. The Incidence of Trichinosis as indicated by Post-Mortem Examination of 300 Diaphragms.**—*Public Health Rep.* 1937. Apr. 16. Vol. 52. No. 16. pp. 468–490. [18 refs.]

ii. —— & ——. **Studies on Trichinosis. II. Some Correlations and Implications in Connection with the Incidence of Trichinae found in 300 Diaphragms.**—*Ibid.* Apr. 23. No. 17. pp. 512–527. [11 refs.]

iii. ——. **Studies on Trichinosis. III. The Complex Clinical Picture of Trichinosis, and the Diagnosis of the Disease.**—*Ibid.* Apr. 30. No. 18. pp. 539–551. [14 refs.]

i. The method of diagnosis was two-fold: a squash preparation of 1 gram of diaphragm; a digestion for 24 hours in artificial gastric juice of a mean of 113 grams, the fluid being run on to a screen of 80 to 100 meshes in a Baermann funnel and allowed to stand for an hour. Of the 300 diaphragms 41 were positive, of these the latter brought to light 70·7 per cent. and missed 29·3 per cent., but it missed no case in which the larvae were living. When they are not, its failure is probably roughly measured by its detection of 23 larvae in a 100-gram sample when the microscope has counted 993 in 1 gram. This is the writers' summary:—

" A study of 300 diaphragms from cadavers, coming from 10 hospitals in Washington, D.C., and 1 hospital at Baltimore, Md., shows 41 diaphragms infested with trichinae, an incidence of 13·67 per cent.

" The samples include cases from 5 Federal hospitals to which patients are sent from all over the United States, and from 6 Washington hospitals with cases originating widely over the United States, and they run the range of childhood to old age, military and civil life, association with land and sea, sane individuals and mentally deranged hospitalized cases, black and white, male and female, and high and low economic-social status.

" All diaphragms were examined both by the direct microscopic method and by the digestion-Baermann method, since both methods have special value for certain types of infestation and both have certain limitations, the two methods being supplementary in these respects.

" Examinations were made on a quantitative basis of trichinae per gram of diaphragm muscle examined. On this basis the series is arbitrarily divided into seven groups of lighter to heavier infestations, as a basis for tentative assumption and for further consideration.

" Live trichinae predominate in light infestations and dead trichinae predominate in heavy infestations, and the theory is tentatively suggested that the rapidity of calcification may be proportional to intensity of infestation.

" On the basis of 1,778 cases reported up to the present time, the writers conclude that an indicated incidence of approximately 12·5 per cent., an unweighted average, is a conservative figure, probably definitely too low. If this figure is indicative of incidence throughout this country, there are probably several million persons in the United States who are infested with trichinae, among whom are possibly several hundred thousands who have had clinical trichinosis never diagnosed as such, and there are possibly several thousand deaths annually from this cause.

" The following point is emphasized: That the United States apparently has the greatest problem of trichinosis of any country in the world, a problem involving, in one way or another and in some degree, several million persons. The incidence in man is greater than the incidence in garbage-fed hogs.

" The background of the problem is considered, and an outline of the measures necessary for the control of the parasite, *Trichinella spiralis*, is given.

ii. " On the basis of a study of 300 diaphragms reported in a previous paper by the present authors, which shows an incidence of 13·67 per cent. of trichina infestation, the writers have undertaken a study of correlation of incidence with population groups with the following results :

" The incidence by groups, in descending order of incidence, is as follows : Navy, 33·3 per cent. ; groups associated with extensive travel by sea (Navy and merchant marine), 27·3 per cent. ; military (Army-Navy) enlisted personnel, 25·9 per cent. ; military (Army-Navy) group (as a whole), 25 per cent. ; military (Army-Navy) officers, 23·5 per cent. ; merchant marine, 23·1 per cent. ; Army, 22·9 per cent. ; colored females (all in low economic-social status), 19·6 per cent. ; white males, 17·9 per cent. ; whites (male and female), 15·8 per cent. ; mentally sound group or, at least, cases of minor derangement and not under prolonged hospitalization, 15·3 per cent. ; females (white and colored), 15 per cent. ; persons of low economic-social status (all races), 14·6 per cent. ; (*average of all groups*, 13·67 *per cent.*) ; males (white, colored, and one Mongolian), 13·2 per cent. ; groups associated with land (excluding extensive travel by sea), 12·6 per cent. ; civilian group (as a whole), 11·8 per cent. ; Negroes (male and female), 11 per cent. ; persons of high economic-social status (all white), 9·6 per cent. ; white females, 8·1 per cent. ; mentally deranged group under prolonged hospitalization, 7·7 per cent. ; coloured males (all in low economic-social status), 4·2 per cent.

" The civilian population of Washington, on the basis of cases from 6 civilian hospitals only, has an indicated incidence of 14·2 per cent., and if children under 17 are disregarded the incidence is 15·4 per cent.

" In all cases the indicated correlations between incidence of trichinae and the groups examined are basically with reference to food habits as modified by such factors as occupation, education, standards of living, travel, methods of swine raising, exposure to raw or undercooked pork or protection from exposure by prolonged hospitalization.

" A consideration of the age incidence by decades indicates that, at least up to some unascertained point, there is an increased incidence with increasing age, due apparently to the fact that an increase in the time factor increases the opportunities for infection. At some unascertained point there may be a mortality factor in the form of deaths occurring at an age earlier than would have been the case had it not been for pathologic conditions persisting after recovery from trichinosis, thereby removing from the older age groups some of the positives that might otherwise have appeared there. Positive findings in recent literature indicate the advisability of examining suitable muscle tissue from very young infants and those prematurely born, for the possibility of detecting pre-natal infection with trichinae. The post-mortem study of suitable muscles from persons dying after prolonged confinement in hospitals, jails, and penitentiaries, under modern sanitary conditions precluding the eating of raw or undercooked pork, is suggested as a basis for obtaining more precise information as to the time larval trichinae survive alive in human beings, and the time required for calcification of the cysts and for the death of the trichinae. It is recommended that the microscopic examination of 1 gram of diaphragm muscle, as a press preparation and not by sectioning, be made a routine procedure in the post-mortem examinations by pathologists."

iii. " Since examinations of 1,778 cadavers at 24 hospitals in 11 places in the United States indicate an incidence of at least 12·5 per cent. of trichinae, with not 1 case out of 222 positive cases having been diagnosed as trichinosis at any time, it is evident that our knowledge of the polymorphic picture of clinical trichinosis is inadequate and that we need more information in regard to diagnosis.

" Trichinosis, as a disease, is determined by the presence of larval and adult worms in the intestine, and of larvae in the lymph, blood, lymph nodes and glands, brain, heart, voluntary muscles, and other tissues and certain cavities. The disease is conditioned by the numbers of worms present, the size of the patient, the tissues invaded, and the individual patient's physical condition, resistance, and concomitant pathologic conditions present.

" As regards numbers of worms present, we are certain that such large numbers of larvae as 1,000 per gram of muscle will produce severe clinical trichinosis, and suspect that such small numbers as one larva per 100 grams will not produce clinical trichinosis, but we have no data on which to judge intermediate degrees of infestation. Within this range of intermediate infestation there is undoubtedly a large group of cases of atypical clinical trichinosis, much larger than the group of so-called typical cases, which is unknown and unstudied.

" As regards the size of the patient, the same number of larvae in a small individual will give a higher concentration of larvae per gram, so that a given number of worms may cause, relatively, four times as much damage, or more, in one individual as they will cause in another.

" As regards tissues invaded, the wide range of tissues damaged gives rise to numerous cases in which the predominant symptoms are those of diseases of infectious sorts other than trichinosis, of heart disease, of respiratory disease terminating in pneumonia, often fatal, of meningitis and other disturbances of the nervous system, of eye lesions, and other conditions. Approximately 50 disease conditions confused with trichinosis are listed.

" As regards the condition of the individual patient, we expect the most variegated clinical picture associated with weaknesses in various organs, sometimes with death so closely correlated with the attack on one weak organ, such as the heart, that trichinosis is never suspected.

" To clarify our picture of trichinosis, especially of atypical clinical cases caused by infestations of intermediate extent, as opposed to very heavy or very light infestations, calls for much research and co-operation by pathologists, clinicians, and parasitologists. Quantitative studies are especially necessary.

" The various laboratory aids in diagnosis are noted, and their limitations pointed out." *C. L.*

MAIER (Conrad). Zur Kenntnis der Trichinose. [**On an Outbreak of Trichinosis.**]—*Schweiz. Med. Woch.* 1937. Mar. 20. Vol. 67. No. 12. pp. 248–250. With 3 figs.

A small epidemic of trichinosis, affecting five persons seen at the hospital of a Swiss Canton is described, the diagnosis being established by excising muscle. In three of them an antigen skin test was positive. In one there was a condition of heart block. Eosinophils lay between 8 and 32 per cent. But in another man with chronic muscular pains and an eosinophil rate of 4 per cent., excision of a piece of biceps showed trichinosis. *C. L.*

BEARUP (A. J.). **A Search for *Trichinella spiralis* in Cadavers in Australia.**—*Med. Jl. Australia.* 1937. Apr. 3. 24th Year. Vol. 1. No. 14. pp. 504–505.

" 1. Microscopic examinations of 119 cadavers in Australia for *Trichinella spiralis* resulted in three positive results being obtained.

" 2. In each case the progress of calcification and the microscopic appearance of the larvae indicated that the infections were not recent. They were probably acquired outside Australia."

The men had come to Australia 72, 40 and 58 years earlier. The first and second had not left it again, the third's later movements were unknown.

" 3. No case of *Trichinella spiralis* in man or animal has yet been shown to have originated in Australia." *C. L.*

Ch'in (Yao-Ting). **Trichinella Infection in a Cat in Mukden.**—*Chinese Med. Jl.* 1937. Apr. Vol. 51. No. 4. pp. 500–501. With 3 figs. on 1 plate.

In reporting trichinella infection in the tongue of a cat in Mukden (the rest of the animal had long since been destroyed), Ch'in takes the opportunity of correcting the statement of Faust (1929) that " neither pigs nor rodents have thus far been found infected in China, thus refuting the theory that the disease was introduced into Europe with the Chinese pig (1820–1830)," seeing that Manson reported it in Chinese pork in the China Imperial Customs Medical Reports of 1880–81. *C. L.*

Scheifley (Charles H.). **The Localization of *Trichinella spiralis* in the Muscle of its Host.**—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 349–353. [13 refs.]

In 5 bitches the entire left lumbar sympathetic chain and ganglia were removed and 4 months later they were fed on trichinous meat. Although, as measured by Herrick, Essex and Baldes, the flow of blood in the left hind leg would thereby be doubled, the numbers of trichinae in that limb were not increased. As usual they were greatest in the diaphragm. *C. L.*

Kreis (Hans A.). Die Entwicklung der Trichinellen zum reifen Geschlechtstier im Darme des Wirtes. [**Development of Trichinella to Maturity in the Intestine of the Host.**]—*Zent. f. Bakt.* I. Abt. Orig. 1937. Feb. 16. Vol. 138. No. 5–6. pp. 290-302. With 8 figs.

These results were got by killing rats at 2-hourly intervals up to 36 hours and thereafter at 12-hour intervals up to 240 hours after they had had an infective meal.

Female worms grow more quickly than males, the sexes are first distinguishable when the male papillae form at 18 hours, but by working back the first statement is substantiated. The females possibly undergo 4 ecdyses at these hours : 2 to 8, 12 to 16, 48, which is after copulation has taken place, and 72 which is before embryos have developed. The males show 2 ecdyses before the sexual shape is taken and a third at 20 hours. *C. L.*

Matoff (Konstantin) & Wapzarowa (Mara). Wieviel Jungtrichinellen kann eine weibliche Darmtrichinelle gebaren ? [**How many Young Trichinae can an Intestinal Female Trichinella bear ?**]—*Ztschr. f. Infektionskr. d. Haustiere.* 1937. Vol. 51. No. 2. pp. 89–98.

The authors conclude that the question in the title should have been " How many measles appear in muscle when there is a single female in the intestine ? " The answer is that when only 2 measles were given to each of 23 mice there was development of muscle trichinosis in 8 only [presumably because only in a third of the cases they were male and female] and in them the number of larvae found in muscle

varied from 2 to 507, mean 315. Apart from the mouse with 2 the lowest number was 230 ; so that presumably all born do not necessarily grow to infectivity. *C. L.*

IYENGAR (M. O. T.). **Public Health Aspects of Filariasis in India.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 300–307. With 1 map & 7 figs.

" The present position in India is that we have not the accurate data on filarial endemicity in different parts of India to enable us to compare conditions in one area with those of another. Filariasis is a widespread disease in India and, although cases of death due to filariasis are rare, the extent of incapacitation and of sickness due to it is very large. No one seems to have ever attempted to estimate the number of persons suffering from filariasis in India.

" The respective distribution in India of the two filaria infections, *Filaria malayi* and *Wuchereria bancrofti*, has not been adequately surveyed. This information is of considerable public-health importance because measures for the control and prevention of the disease to be undertaken in *F. malayi* areas are entirely different from those to be employed in *W. bancrofti* areas. The control of the spread of *F. malayi* infection through the clearing of *Pistia* from ponds and other water collections carried out in Shertalai taluk mentioned previously has been successful and should commend itself to other areas with similar conditions. This type of control work is perhaps the first of its kind.

" The position in regard to the control of filariasis in India is very disappointing. There is very little work done in India on the control of this disease which maims a large number of persons and causes considerable suffering. While it is nearly impossible to cure filariasis, it should be easy to control the spread of the disease through suitable measures, especially as the disease is restricted to comparatively small areas." *C. L.*

O'CONNOR (F. W.) & BEATTY (H. A.). **The Abstraction by *Culex fatigans* of *Microfilaria bancrofti* from Man.**—*Jl. Trop. Med. & Hyg.* 1937. May 1. Vol. 40. No. 9. pp. 101–103. With 1 chart.

Further evidence is given to show that *C. fatigans* can abstract at a single blood meal many more *Microfilaria bancrofti* than may be abstracted in the same quantity of blood by mechanical means.

Culex fatigans and *Aëdes aegypti* each take about 1 cmm. of blood at a feed. When left inside a mosquito net for two hours with a man, the numbers of microfilariae in his blood and of larvae in these mosquitoes were as follows :—

Hour	Micro-filariae in 1 cmm. of man's blood	Larvae in	
		C. fatigans	*A. aegypti*
6 to 8 p.m. ...	8·35	1 to 17, mean 8·8	0 to 6, mean 2
8 ,, 10 ,, ...	13·75	21 ,, 372, ,, 146·5	3 ,, 8, ,, 5·3
10 to midnight ...	8·9	10 ,, 183, ,, 56·7	3 ,, 81, ,, 42·0
Midnight to 2 a.m.	6·55	9 ,, 738, ,, 193·2	5 ,, 21, ,, 9·75
2 to 4 a.m. ...	6·8	15 ,, 516, ,, 108·1	0 ,, 16, ,, 7·0
4 ,, 6 ,, ...	4·9	10 ,, 55, ,, 38·9	3 ,, 53, ,, 23·5
6 ,, 8 ,, ...	0·1	4 ,, 21, ,, 14·75	0 ,, 1, ,, 0·5

When 5 Culex were allowed to feed all night on this man, the numbers of embryos in them were between 79 and 268, mean 170. In dissection of 2,600 wild *C. fatigans* more than 100 larvae were found in 9 of them ; in 360 wild *A. aegypti* infection was more often found but was slight, 4 to 6 parasites as a rule with a maximum of 81. In considering the greater weight of infection in Culex, chemotaxis, the size and depth of penetration of the mouth parts of the mosquito and the entanglement of microfilariae in them are considered but not the relative losses of the parasites per anum in different individuals and species of mosquitoes nor the possibilities of multiple feeds after blood has been so passed.

C. L.

VAN DER HEIJDE (C. G.). Samenvatting van een onderzoek naar microfilariadragers onder de Chineesche arbeiders bij de Bankatin-winning op Banka. [**Investigation of Microfilaria Carriers among Chinese Coolies of Banka.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. May 25. Vol. 77. No. 21. pp. 1288–1297. With 3 maps.

Examination of coolies enlisted for the tin mines of Banka, an island in the Netherlands Indies, showed that 2·5 per cent. were carriers of microfilariae. It was the new arrivals from China and especially those from the province Kongtoen who were infected. Coolies enlisted from the Chinese who had been resident for two years or more in Banka were not infected to the same extent. All the microfilariae were of the species *malayi*. No evidence was forthcoming that infection with microfilariae was associated with a greater sickness rate or a lessened work rate in infected than in non-infected coolies.

W. F. Harvey.

LANE (Clayton). **Bancroftian Filariasis and the Reticulo-Endothelial System.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 61–80. With 4 figs. (2 on 1 plate). [42 refs.]

MANSON held the view that microfilariae, in filariasis due to *Wuchereria bancrofti*, retired to the large vessels and lungs diurnally, and emerged therefrom nocturnally. His observations on the classical case in which he recovered large numbers of larvae in these situations led him to this belief. This case was one in which death resulted from cyanide poisoning ; the post-mortem was performed six hours after death. Manson's findings led him to fallacious deductions owing to the current lack of knowledge of post-mortem lymph flow. Because large numbers of larvae were found in the large arteries six hours after death it did not mean that they were there ante-mortem. Clayton Lane has already expressed his belief that microfilariae possess no mechanism by which they can maintain themselves in the current in the large vessels.

Microfilarial periodicity may be likened to a tidal phenomenon. It is attributable to two entirely separate and distinct mechanisms. The rising tide is due to regular synchronous parturition of the fertile female worms ; the falling tide is caused by the immobilization and destruction of the liberated microfilariae by the reticulo-endothelial system. Anatomical studies by O'CONNOR and others support the explanation of the mechanism of the first part of the cycle. In this paper, numerous observations by various workers are put forward and correlated to account for that of the second.

When helminths enter animal tissues the motile cells of the reticulo-endothelium actively assail them. The presence around worms of these cells—giant cells, endothelial cells, fibroblasts, etc.—has been noted for many years, but their significance has been missed. They actively attack and destroy the larvae in the lymph nodes before they can reach the blood. By their accumulation at these sites and final development into fibroblasts they cause lymphatic obstruction, and a condition then favourable to further fibroblast formation and of elephantiasis with or without lymphangitis. Lymphangitis is liable to occur owing to the favourable medium provided for infection, and when it does occur leads to yet further fibroblast formation.

There is evidence of complete destruction of microfilariae for months or years before any at all reach the circulatory blood. Eventually the barriers, in the form of lymph nodes, are by-passed; but the number of circulating microfilariae is no measure of the number actually born, and still less so of the number of female worms. There is a lag of 10 or 12 hours between the birth of the larvae and their appearance in the blood. This is due to their slow carriage by the lymph current, and to some extent it is dependent on the site of the mother worm and the consequent extent of the body defence to be pierced before the circulation is reached. Microfilariae found in the circulation during the period of low tide may be due to mis-timed parturition by individual female worms, or to fatigue and partial or complete blocking of the reticulo-endothelium.

Massive destruction of microfilariae in the human body has been held to be impossible, as it would produce severe reaction of the type of protein shock. This is not the case, as has been demonstrated by several workers when inoculating, experimentally, large numbers of larvae. The anatomical evidence of massive daily microfilarial destruction by the reticulo-endothelial system is so far scanty—it has not been sought extensively or systematically. Clayton Lane states that the whole subject of microfilarial periodicity requires full, detailed and unbiassed examination, and indicates certain lines along which he considers such inquiry might profitably be pursued.

This important paper covers such a field in anatomy, physiology, pathology and other subjects pertinent to its theme that it is impossible to give other than a general résumé of the main points. It should be consulted in the original by those interested in this subject.

A. R. D. Adams.

KARIADI. Aanteekeningen over filariasis. [**Notes on Filariasis.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. Apr. 13. Vol. 77. No. 15. pp. 912–921. With 1 map & 2 charts.

A survey of the conditions existing on the coast of North New Guinea was made by the author as regards filariasis. Parasite carrier indices of 41, 42 and 14 per cent. were found for males, females and children respectively. This low index for children as compared with adults is ascribed to the time which it takes for the appearance of embryo filariae in the peripheral blood, in conjunction with the long duration of development of larvae to the mature sexual form. The filariasis of this region was found to be due to *Wuchereria bancrofti*. An interesting experiment was made to determine approximately the best time to examine the blood in order to detect the presence of microfilariae. Six persons were examined by a thick drop-method,

each at the hours of 10 a.m., 1 p.m., 4 p.m., 7 p.m., 10 p.m., 1 a.m., 4 a.m., and 7 a.m. with the result that for these six persons a total of 9, 0, 22, 176, 472, 482, 382 and 58 parasites respectively was found in a measured amount, 25 cmm. of blood. It may be concluded that the maximum number of microfilariae was present between 10 p.m. and 4 a.m. [thus agreeing with earlier investigators] and that examinations conducted at 7 p.m. or even 7 a.m. have a good prospect of finding the embryos required to make the diagnosis positive. It was found that an index estimation even as late in the day as 8.30 a.m. was none too bad. *W. F. Harvey.*

Elsbach (E. M.). *A. barbirostris Bancrofti* als overbrenger van filaria Bancrofti. [*A. barbirostris bancrofti* **as Vector of** *W. bancrofti*.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. June 22. Vol. 77. No. 25. pp. 1536–1543.

The investigation relates to New Guinea, and it appears that there the malaria carrying mosquito, *A. barbirostris bancrofti*, also transmits *Wuchereria bancrofti*.

In the natural state filarial larvae were found in mosquitoes in all stages of development, even in one and the same mosquito, so that infectivity would persist for some time. Microfilariae were sought for in the peripheral blood about 10 p.m. Infection of inhabitants of the kampongs examined worked out at about 10 per cent. The natural infective mosquito index for a total of three months was 10·9 per cent. As regards the estimation of the artificial infective mosquito index, one of the first difficulties encountered was to get even such an anthropophile mosquito as *A. barbirostris bancrofti* to bite the volunteers who presented themselves. Apparently the mosquito was easily frightened. Success was finally obtained by administering a narcotic to the human test subjects within the mosquito curtains into which mosquitos had been liberated. Even then difficulties were met with. The artificial index, as determined in one experiment with 20 anopheles mosquitoes that had sucked blood, was 35 per cent. Not a single culicine mosquito had been infected. Mosquitoes were examined as they died after having sucked blood. One remained alive for eight days, but was negative as regards filarial infection. One mosquito, however, remained alive 148 hours and showed not only the sausage type of worm in the thorax but four mature larvae ; four mature forms were also found in the head and two in the proboscis ready to make their exit. It is obvious then that a single mosquito can infect one person after another. In all the experiments the artificial infective index was higher than the natural and the longest duration for which the mosquitoes could be kept alive was 14 days. This is an important finding, for it is known that *Microfilaria bancrofti* can attain full development in 6 to 8 days. *W. F. Harvey.*

Abe (S.). **Development of** *Wuchereria bancrofti* **in the Mosquito** *Culex quinquefasciatus*.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1937. Mar. Vol. 36. No. 3 (384). [In Japanese pp. 483–515. With 55 figs. on 5 plates & 1 text fig. [24 refs.] English summary pp. 516–519.]

A detailed description of the anatomy and developments of the larva of *W. bancrofti* while in *C. quinquefasciatus* at a temperature of 25°–28°C., infectivity being reached after 15 days. Of the two ecdyses

one allows larval escape by the separation of a cap at the anterior end, the other by a split about its middle. Of the " genital cell " only the most anterior (G 1) is really so, the other three go to make a ring between the mid and hind guts. The 55 drawings give the cell arrangements a striking symmetry and simplicity and are fully described in English. *C. L.*

Archiv für Schiffs- und Tropen-Hygiene. 1937. Mar. Vol. 41. No. 3. pp. 349-350.—Filaria bankrofti in Abessinien [Lüders (H.)]. [**Infestation with *W. bancrofti* in Abyssinia.**]

Lüders writes that he has found *Mf. bancrofti* in the urine of a patient at Bedelle in Abyssinia [who presumably was a local man]. *C. L.*

Sanner (A.), Destribats &, Albrand. Hématochylurie datant de dix ans chez une réunnionaise. Présence de *Wuchereria bancrofti* dans le sang. [**Ten Years' Chyluria in Réunion in One with *Mf. bancrofti* in the Blood.**]—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 109–112.

Intermittent chyluria had been present in this man for 10 years and *Mf. bancrofti* was found, evidently in small numbers in the blood.

The urine was salmon coloured, opalescent, with many red cells, with renal epithelium and crystals of calcium oxalate, but no microfilariae. The percentage of fat was 2·3, of cholesterine 0·1, sugar 0·7, albumin 1·1, acetone and diacetic acid 0. The blood, apart from the few microfilariae, showed red cells 4,500,000, haemoglobin to Tallqvist 25 ; and of 3,600 leucocytes 2·5 per cent. were eosinophils. There were no other symptoms, apparently, of Bancroftian filariasis. *C. L.*

Lane (Clayton). [**Lymphangitis and Filariasis in the West Indies.**] [Correspondence.]—*Jl. Trop. Med. & Hyg.* 1937. Apr. 15. Vol. 40. No. 8. p. 100.

A leading article having commented on O'Connor's paper [this *Bulletin*, 1937, Vol. 34, p. 460] stressing the difficulty of defining the parts played by *W. bancrofti* and the β-haemolytic streptococcus in causing the lymphangitis of Bancroftian filariasis, Lane cited the Boston work by Drinker and his colleagues as proof that elephantiasis makes for greatly increased susceptibility to this bacterium (in their experiment a four million increase) and such infection and inflammation in turn increase the elephantiasis. As to the work by Drinker and his colleagues at Harvard University and that by O'Connor and his at Columbia University, Lane adds " During the last three years the work initiated in that 200-mile strip of North American coast has laid tropical medicine under a very great debt." *C. L.*

Advier (M.) Note sur la lymphangite endémique et son traitement à la Guadeloupe. [**Endemic Lymphangitis and its Treatment at Guadeloupe.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 359–361.

In the endemic lymphangitis of Guadeloupe, microfilariae have been found in the blood with no greater frequency than among those who

do not get these recurrent attacks, but on the other hand at the moment of the attack of fever a pure culture of a streptococcus has been got from blood and lymph. The treatment found useful has been twofold: first, immediately the attacks come on septazine (benzyl-amino-benzene-sulphamide) three doses of 0·5 gm. a day each for 3 days is believed to have shortened attacks; and then for prevention an anti-streptococcic vaccine in 6 injections given twice yearly. *C. L.*

Morales-Otero (P.) & Pomales-Lebrón (A.). Formación de antie-streptolisinas y antifibrinolisinas después de los ataques agudos de linfangitis tropical recurrente. [**Formation of Antistreptolysins and Antifibrinolysins after Attacks of Tropical Lymphangitis.**]—*9a Reunión Soc. Argentina Patol. Regional, Mendoza, 1, 2, 3, y 4 octubre 1935.* Vol. 2. pp. 854–868. With 4 graphs & 1 fig.

This article is of particular interest to those who maintain that streptococci play a part in recurring tropical lymphangitis and elephantiasis. The authors show that soon after the first attack of this lymphangitis there is developed a high grade of antifibrinolytic and antistreptococcal potency in the blood and they conclude, in conformity with the views of Todd, Coburn, Tillet and Garner that such attacks of lymphangitis are always preceded by an infection with *Strept. haemolyticus.*

H. H. S.

Bourguignon (G. C.). Un cas d'hépatite aiguë mortelle avec localisation massive de *Microfilaria perstans* dans le foie. [**Acute Fatal Hepatitis associated with Large Numbers of** *F. perstans* **Embryos.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 1–5. With 2 plates.

The author's expressed intention is simply to record a massive localization in a deep organ of a parasite whose normal habitat is the blood.

A native soldier at Elisabethville was admitted to hospital with violent hepatic colic and with uncontrollable bilious vomiting coming on suddenly after a meal. He died two days later. In view of talk of poisoning an autopsy was ordered and the liver was found strikingly enlarged and jaundiced, the only lesion apart from pulmonary congestion. The liver was crammed with microfilariae, much search disclosed in a section a whole one with a length of 151μ and with the characteristics of *Mf. perstans.* Microphotographs, drawings and original preparations were sent to Wenyon and Hoare who reported "The liver shows areas of necrosis which appear to be of bacterial origin; in sections numerous microfilariae are present, but they do not seem to be responsible for the condition observed." There were no microfilariae in the congested vessels of the lungs, nor had any been seen in blood taken from this man on two occasions while he was in hospital. The author's view seems summed up in a sentence; the necrotic areas, the general state and the secondary lung condition are in favour of septicaemia and do not allow of any pathogenic rôle being given to *Mf. perstans.* [From the author's note that the invasion of the liver by microfilariae was probably recent it seems fair to conclude that no degeneration was detected in them.] *C. L.*

Tesch (J. W.). Over Filariasis en Elephantiasis bij een geïmporteerde Javaansche bevolking in Celebes. [**Filariasis and Elephantiasis in an Imported Javanese Population in Celebes.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. June 15. Vol. 77. No. 24. pp. 1434–1461. With 1 sketch map and 2 diagrams. English summary.

The comparison is made of a population of Javans found in the midst of the island population of Celebes. The district was one which comprised coast land, plateau and mountain. In the native area kampongs were grouped according to the prevalence of microfilariasis and elephantiasis. It was found that with percentage indices for filariasis of 0–5, 5–10, 10–20, 20–35, 35–50, 50 and over, the percentages of elephantiasis were 0·2, 0·4, 0·6, 1·1, 2·7 and 4·7 respectively. There is thus a positive correlation between filariasis and elephantiasis. All the infections were of *Microfilaria malayi* and any *bancrofti* met with was imported. A peculiarity of the infection with *malayi* seems to be that the associated elephantiasis is of the legs and not of genitalia or scrotum. The filarial periodicity was purely nocturnal and, as is usual in these infections, it was very exceptional to find any microfilariae in the blood of sufferers from elephantiasis.

Special consideration was given to the colony of Javans, mainly from mid-Java, which differed somewhat in the relation of elephantiasis to filariasis from the indigenous population. Briefly stated this difference consisted in a higher proportion of elephantiasis and a lower filariasis index for the Javans. Both filariasis and elephantiasis of course increase with increase of age. Thus for ages, 0–5, 5–10, 10–20, 20 and over, the filariasis percentages were respectively 9·9, 15·6, 21·5, and 31·8, while the corresponding percentages of elephantiasis were 3·3, 7·8, 7·7 and 25. There is thus distinct increase in the indices of filaria and elephantiasis " with the length of the period of exposure to infection." From the fact that elephantiasis among the Javanese born in the colony was less than that of those who had been brought over as adults from Java, it is concluded that the adult coming freshly into the highly endemic area is the more likely to develop the elephantiasis sequel to filarial infection than the country-born.

W. F. Harvey.

Brug (S. L.). De overbrenging van *Filaria malayi* te Kalawara (o.a. Paloe, Res. Menado). [**The Transmitter of** *F. malayi* **in Kalawara (Celebes).**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. June 15. Vol. 77. No. 24. pp. 1462–1470. With 1 diagram. English summary.

" In Kalawara (Paloe Division, Celebes) *Anopheles barbirostris* was found to be the only carrier of *Filaria malayi* and an excellent one. The artificial infection-index was 99 per cent. Development of the worm in the mosquito was completed in 8½ days, sometimes after 6½ days, mature larvae were seen in the head. In mosquitoes sectioned after 9½ and 10½ days not a single immature larva was seen. The natural infection-index was 8·1 per cent., about half of the naturally infected mosquitoes containing mature larvae. Whereas in other parts of the Malay Archipelago, *A. barbirostris* rarely attacks man, in Kalawara and Mamoedjoe (Celebes, cf. Jurgens, 1932) it readily sucks human blood. *A. bancrofti*, generally recorded as very anthropophilous, was found in fair numbers in a cow-shed, but did not seem to attack man in Kalawara."

Galliard (Henri). Un parasite de l'homme, nouveau pour l'Indochine *Filaria malayi* Brug 1927. [*Microfilaria malayi* **reported in Man for the First Time in Indo-China.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Oct. Vol. 14. No. 8. pp. 1091–1093.

Microfilaria malayi has been reported east and west of Indo-China. In 170 patients in hospital, none of whom had symptoms of filariasis, there were microfilariae in the blood of 22, all *Mf. malayi*. It is confirmed that *C. fatigans* could not be infected from this microfilaria.

C. L.

Roubaud (E.) & Colas-Belcour (J.). Nouvelles recherches sur l'évolution expérimentale de *Dirofilaria immitis* chez quelques culicides indigènes. [**New Work on the Development of** *D. immitis* **in Culicines in France.**]—*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 480–484. With 1 fig.

Anopheles maculipennis plays the predominating rôle, *Aëdes punctor* and *Aëdes geniculatus* are occasionally infected, but in *Anopheles plumbeus* development does not seem to go on to infectivity. *C. L.*

Roubaud (E.). Nouvelles recherches sur l'infection du moustique de la fièvre jaune par *Dirofilaria immitis* Leidy. Les races biologiques d'*Aëdes aegypti* et l'infection filarienne. [**Dirofilarial Infection in** *Aëdes aegypti* **as affected by its Biological Race.**]—*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 511–519. With 1 fig.

Dirofilaria immitis develops unequally well in different biological races of *Aëdes aegypti*, and in the race least complacent of parasitism, that from Cuba, the microfilariae from different dogs also develop unequally well. *C. L.*

i. Augustine (Donald L.). **Description of a New Filariid from Ground Doves of St. Croix, Virgin Islands.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 47–54. With 9 figs.

ii. ——. **Observations on Living "Sheathed" Microfilariae in the Capillary Circulation.**—*Ibid.* pp. 55–60.

i. *Vagrifilaria columbigallinae* n.g., n.sp. from the blood vessels (peritoneal, splenic, pancreatic, pulmonary) and from the auricles and ventricles of the heart is of importance to tropical medicine in that it has a sheathed microfilaria closely resembling *Mf. bancrofti* and that it has already been used (*vide* ii.) to clear up points in the behaviour of the latter in the circulation. A single bird often harbours 26 to 36 adult worms (male about 13 mm. long; females 20 to 23 mm.) and the microfilariae in enormous numbers are present at all hours, but apparently mostly at night. Adults and larvae are described in detail and the systematic position is considered.

ii. In effect this work is the result of the reviewer's comment on the behaviour of the sheathless *Mf. immitis* in the blood circulation which was reported by Augustine, Field and Drinker (this *Bulletin*, 1937, Vol. 34, p. 35). Working with Professor F. W. O'Connor in the United States Virgin Islands, the sheathed microfilariae of *V. columbigallinae* and of *Wuchereria bancrofti* were injected into the frog, *Rana*

pipiens, local bats having too much pigment for their wing capillaries to be clearly seen. Into the abdominal vein of a frog anaesthetized with urethane the microfilarial blood was injected. In a typical experiment with *Mf. columbigallinae* 0·3 cc. of heparinized dove blood, heavily infected, was injected at 11·05 a.m. and the web of a foot mounted for observation by a water immersion lens. The condition seen 45 minutes later was this :—

" 11.50 a.m. Numerous, exceedingly active, microfilariae observed travelling with and against blood stream in capillaries and in larger vessels. They cross capillary net work from venous to arterial side and from arterial to venous side, back out of temporary obstructions (occlusions due to lodged white and red blood cells) seeking an avenue of escape with tail, turn about in the capillaries and proceed in opposite direction. Ten to fifteen microfilariae are frequently seen in ' nests ' (occluded capillaries). They are very active, knocking each other and the stagnated cells about in the effort to escape. Suddenly some distant barrier apparently was released and all microfilariae disappeared *en masse* into the active circulation. Contours of the vessels are not altered by movements of the microfilariae. The ' sheath ' is not seen on any microfilaria."

About five hours later their numbers in capillaries were notably fewer and 4½ hours later there was none, nor were they seen again. None was found at any time in the dorsal lymph space.

" Experiments of this type clearly show that ' sheathed ' microfilariae actively and forcibly migrate through the capillaries, all their movements having the effect of keeping them in the circulating blood. Their travel in the capillaries is as effective as that of ' unsheathed ' microfilariae."

In experiments with blood taken at night the behaviour of microfilariae showed no apparent difference. Experiments with *Mf. bancrofti* were unsatisfactory, for obtainable infections in man were light and the larvae did not survive haemolysation in the attempt to concentrate them.

" Frogs killed from 18 to 31 hours after injection with *Mf. columbigallinae* or *Mf. bancrofti* show these distributed throughout the liver but none in the other organs. They lie in the liver sinusoids and occasionally in the veins. Many appear to have been alive and active at the time of fixation—as judged by the normal position of the body nuclei, smooth cuticula, and characteristic curves of the body indicative of active progression. Others were apparently dead and showed degenerative changes—the nuclei distorted, the cuticle crumpled, and the body lacking the characteristic contours of normal microfilariae. There was no cellular infiltration.

" Livers of frogs killed 5 days after injection with microfilariae showed no organisms. There were, however, scattered throughout the liver, fairly numerous small areas of lymphocytic infiltration which may possibly represent a late reaction persisting after the disappearance of microfilariae. If such be the case, the earlier cellular response was not obtained in our limited series."

Degenerating forms were not found in other organs and the question is raised whether the liver does not merely get rid of feeble circulating forms.

No sheath was ever seen on microfilariae while in the capillaries, nor on *Mf. columbigallinae* in freshly drawn heparinized blood.

" The formation of the ' sheath ' could always be followed on the slide as the medium surrounding the larva dried. The process was repeatedly observed on *Mf. bancrofti* and *Mf. columbigallinae*. The larva is

mechanically held in the ever thickening medium. In its efforts to push on and back out, the once close-fitting, inconspicuous outer covering is continually stretched until complete drying of the preparation prevents further movement of the microfilaria, which then perishes."

As to the origin of the sheath—

"Developing microfilariae from the uterus of *Vagrifilaria columbigallinae* clearly show the vitelline membrane surrounding eggs containing coiled larvae, but none of the microfilariae from the vaginal region show any evidence of a sheath. From this same region of the uterus are found accumulations of crumpled, hyaline objects, similar in size and shape to the membranes enclosing coiled embryos taken from a higher level of the uterus. These we interpret to be discarded vitelline membranes of mature microfilariae.

"It appears, therefore, that the 'sheath' on the species of microfilariae studied is comparable to that of infective hookworm larvae—namely, the result of an incomplete ecdysis."

C. L.

Moorthy (V. N.). **A Redescription of** *Dracunculus medinensis*.—*Jl. Parasitology*. 1937. Apr. Vol. 23. No. 2. pp. 220–224. With 14 figs. on 3 plates.

The number of dogs in which dracunculus infection has been experimentally established is now 6 [*cf.* this *Bulletin*, 1937, Vol. 34, p. 35] and from them 47 male and 181 female guineaworms have been got, the males from 1·2 to 2·9 cm. long, the females from 1·5 to 53. The anatomy of the sexes is described, the males having equal spicules 490 to 730μ, and a gubernaculum, 200μ long. The vagina contains a mucoid plug when the female has reached 24 mm. long, and since no males were found when the infection had reached an age of six months it is felt that impregnation must take place in the early months.

C. L.

Jospin (Y.). Note sur deux kystes à filaire de Médine à localisation rare. [**Cystic Swellings due to** *D. medinensis*.]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. p. 146.

Two men from the Ivory Coast had each a tumour as big as a large almond near the angle of the scapula, moving on the deep fascia, and showing the shadow of calcification to X-rays. On excision a fibrous capsule enclosed a knotted single worm with a diameter of 1·5 mm., which proved to be *D. medinensis*. *C. L.*

Galliard (R.) & Sicé (A.). Les arthrites purulentes provoquées par "*Dracunculus medinensis*" et leurs sequelles. [**Purulent Arthritis due to** *D. medinensis*.]—*Marseille-Méd.* 1936. Dec. 25. Vol. 73. No. 36. pp. 724–730.

A guineaworm pointed near the knee of this girl and was extracted, as is usual locally, by tension; she was then aged 5 years. There followed suppuration of the knee joint during which the patella and bits of fascia and ligament came away; and though several times at the point of death with great wasting, she was seen, stout and well, at the age of 20, with bent knee and wasted muscles, her state being detailed. *C. L.*

STRONG (R. P.). **Onchocerciasis in Central America and Africa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 487–499.

In this, the first Chadwick Lecture of the Royal Society of Tropical Medicine and Hygiene, is given an account of personal experience of onchocerciasis in both hemispheres.

While in the New World ocular symptoms have been associated with onchocerciasis since its first description there by ROBLES in 1915, it was not till HISSETTE did so for the north-western Katanga Province in 1932 that the connexion was recognized for the Old; and this connexion led to the organization of Strong's expedition which by sea, rail, river, road and foot-trail reached the district most severely infected, about 5° to 6° S. and 23° to 24° E. In it are no white people at all, the inhabitants are Bantus and pigmies. In this part all those examined are infected and few of the population were not examined. In 156 ocular cases there was special study of the eyes, and in 40 of them that study was histological. While in Guatemala there was eye disturbance in 5 per cent. of those with onchocerca infection, in the village of Illebo in north-west Congo the percentage of this in its 150 inhabitants was 45, that of total blindness 10, and that of nodules on the head in those with eye damage about 62. With the presence of some microfilariae in the bulbar conjunctiva there may yet be no demonstrable lesions in the eye.

As to the terrain and the breeding of Simulium, there is a marked similarity in Guatemala and in this province of Lusambo in Africa—ridges with deep, steep, wooded valleys, with swift streams running at their bottoms in all of which Simulium breeds abundantly. As to occupation, the coffee plantations in Guatemala and the cultivation of cotton, mandioca and the collection of the piassava palm, and the almost daily collection of drinking water (and frequent bathing) in Lusambo bring workers to the fly; this in Guatemala was found infected to not more than 5 per cent., and in the village of Kassende in Lusambo to 33·3 per cent.

As to prevention, it is on infected man that attention should be concentrated in Guatemala, for excision of nodules has reduced human and fly infection there by nearly half, and there the infected areas are sharply bounded. In Lusambo with widespread infection the eradication of breeding places is the most important problem, an extensive engineering one, the species implicated being *S. damnosum* and *S. neavei*. It is believed that an onchocerca present in the eland is *O. volvulus*. Remark was made on the general lack of post-mortem examinations on infected persons.

In discussion D. B. BLACKLOCK commented on the fact that *S. damnosum* by its voracity rendered uninhabited large tracts of very fertile country. As to the cause of the limitation of nodules to the head, his experience suggested that overhead shade and a more clothed body might direct the flies there. Breeding places were not easy to attack, but clearing the ground of vegetation was promising. L. E. HURTADO laid stress on an eosinophilia of 25 to 75 per cent. and on the value of removal of nodules in improving vision. J. RODHAIN redescribed two post-mortem examinations with special reference to the occurrence of microfilariae in the liver. Dr. G. Carmichael LOW and Dr. C. C. CHESTERMAN spoke of Professor Strong's other activities, and His Excellency M. Slavko GROUITCH, the Jugo-Slavian

Minister, of his work in delousing the Serbian Army during the War.

In Professor Strong's reply was this important sentence :

" May I emphasize again the desirability and importance of complete and careful observations at autopsy of all fatal cases, with preservation and histological study of the tissues. Only from such repeated studies shall we be able to learn definitely the distribution of both the adult and larval forms of these parasites." *C. L.*

GIAQUINTO MIRA (Mario). Contributo agli studi sul problema della trasmissione della onchocercosi nel Guatemala. [**Contribution to the Study of the Problem of the Transmission of Onchocerciasis in Guatemala.**]—*Ann. d'Igiene.* 1937. Mar. Vol. 47. No. 3. pp. 109–125. With 3 figs. [12 refs.]

In Guatemala *Eusimulium ochreatum* is the chief vector of onchocerciasis, *Simulium avidum* comes next in importance and *Eusimulium mooseri* last.

Eu. ochreatum is the only species which is typically attracted to man as a source of food and that attraction is marked ; in the endemic zone it is always present in good numbers ; and though it is not always the species present in greatest numbers, yet its preference for man as food gives it greater possibilities for infecting him than fall to the others which prefer to feed on animals ; it is the only species whose distribution coincides with that of onchocerciasis in Guatemala.

C. L.

MÜHLENS (P.). *Onchocerca volvulus* aus Kamerun. [*Onchocerca volvulus* **from the Cameroons.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. May. Vol. 41. No. 5. pp. 430–432. With 3 figs.

A man with a 50 per cent. eosinophilia but with no microfilariae in the blood and no intestinal parasites was questioned as to nodules. There were two small ones over the sacrum, one the size of a lentil, the other of a rice grain. *Mf. volvulus* came out of a piece of excised skin taken from over a nodule and placed in saline ; and when the nodules were removed sections displayed the adult worms and teasing showed larvae and embryonated eggs. The small size of the nodules was reminiscent of those on the head in " *O. caecutiens* " infection. This man's wife too had a strong eosinophilia with no evidence of worm infection in blood or faeces, but would not allow the skin to be snipped.

C. L.

BLACKLOCK (D. B.). **Studies in Rural Hygiene in the Tropics. IV. The Place of Mass Treatment in Tropical Hygiene.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 141-144.

A consideration of the ethics and practice of what is at present generally termed mass treatment.

The term treatment as commonly used presupposes diagnosis. Blunderbuss treatment is the discharge of a variety of drug missiles in the hope that one will hit the target. " Mass treatment " discharges a suitable drug missile without even knowledge whether the target is there to be hit ; it is advised for two different reasons : to relieve symptoms of any possible patients ; to check spread of infection. The permissibility of such mass treatment depends on the deadliness

of the drug used ; for malaria quinine has a low toxicity and has been given in large doses without ill effect ; for hookworm infection carbon tetrachloride has produced many deaths and in such mass treatment, " the death of even a single person, who turns out after all not to have been infected, must weigh heavily in the scales against any benefits those other persons, who did happen to be infected. may have derived from the wholesale procedure." If a drug should be found which unworms with no risk to uninfected, its use, though unscientific, would meet with little objection for cure, but for prevention it leaves unaltered the basic consideration that " as long as insanitary conditions in the villages are allowed to remain such as to favour soil and similar infection, the fundamental problem remains unsolved." He quotes the good report of Dr. MANSON at Cinnemara in Assam of 800 coolies treated by tetrachlorethylene without troublesome symptoms, but with a pleasing feeling of drunkenness. [The same happy approbation was given for the same reason by coolies at Darjeeling in the reviewer's experience of some 50,000 doses of thymol given to over 20,000 persons without anxiety and with no death. In the report of MAPLESTONE and MUKERJI using D.C.F. the cure rate of tetrachlorethylene was 20·8 per cent. (this *Bulletin*, 1930, Vol. 27, p. 419).]

As to schools, if this " mass treatment " is to be carried out [is not the reviewer's " herd treatment " the proper label ?] parents must be told that their child may or may not be infected and, if not, no betterment in health may be looked for. In some schools herd treatment is an annual event, which, if reasonable, implies either failure of earlier treatment to unworm or a reasonable conviction of re-infection, or on the other hand unnecessary treatment for those who are not or perhaps never have been infected.

" We ought in these days to be able to produce a more rational and permanent solution, by an equal effort in education, directed towards teaching the people in rural areas how to provide themselves with safe latrines, and how to use and look after them. Mass treatment with dangerous drugs should be regarded as the last resort, to be sought only when mass education in hygiene has been given a thorough trial and has demonstrably failed." *C. L.*

REVIEWS AND NOTICES.

KIRK (J. Balfour) [M.B., Ch.B., M.R.C.P., D.P.H., D.T.M. & H., Director, Medical & Health Department, Mauritius]. **A Manual of Practical Tropical Sanitation.**—pp. ix + 300. With 46 figs. 1937. London: Baillière, Tindall & Cox, 8 Henrietta Street, Covent Garden, W.C.2. [7*s.* 6*d.*] [Review appears also in *Bulletin of Hygiene*.]

In a foreword to this handy volume, Dr. Balfour Kirk explains that there is no moderately priced book on this subject in the English language suitable for sanitary inspectors. During the course of his work in teaching and administration he has noted the gradual lowering of the standard of work of sanitary staffs which occurs owing to the lack of a ready means of revision. The author has sought to remedy this defect by providing this short well-indexed manual.

The technical subjects discussed are preceded by thirty-five pages of preliminary matter consisting of a chapter on the cell of plant and animal, and one on the anatomy and elementary physiology of the human body, both of which are illustrated by simple explanatory diagrams. The collection of vital statistics, the use of spot maps and the general means of dealing with communicable diseases form the next sections, which are followed by a consideration of diseases spread through the agency of the excreta, such as enteric fever, dysentery, cholera, undulant fever, hookworm, bilharzia and tapeworm infections. A chapter is devoted to diseases spread by discharges from the nose and mouth, including pulmonary tuberculosis (with short sections on bovine tuberculosis and the tuberculin test), diphtheria, cerebrospinal fever, scarlet fever, lobar pneumonia, and pneumonic plague.

The elementary entomology section includes brief descriptions of the structure and life history of some important ticks, flies and mosquitoes, and the insect-borne diseases follow in a natural sequence; a chapter is devoted to miscellaneous communicable diseases.

Methods of disinfection, housing, food (with a special chapter on milk and control of milk production), water supplies, disposal of sewage and refuse are each discussed.

Balfour Kirk expressly states that in a book such as this there can be little original, except the selection of material and the style. These, however, are very important exceptions, since only practical experience can guide in the decision as to what to include in a brief manual and an obscure method of presentation might render even the most informative work uninspiring. With regard to both of these difficulties, namely, the careful selection of topics and the treatment of them in concise and simple language, the author has been highly successful.

Not only sanitary inspectors but many medical men also will find this book of good service. Estate and mine managers, engineers and others in charge of labour in tropical regions, faced as they are with problems affecting the health of their employees in circumstances where technical aid may not be at hand, will be well advised to provide themselves with this practical guide to tropical sanitation.

D. B. Blacklock.

CENTRAL COUNCIL FOR HEALTH EDUCATION. **Health Education Year Book 1937–8.**—144 pp. 1937. London: 1, Thornhaugh Street, Russell Square, W.C.1. [5*s.*]

THE BRITISH FILM INSTITUTE. **Supplementary Catalogue of British Medical Films of Technical Interest to Medical Practitioners and Students. Jan. 1936–Jan. 1937.**—16 pp. London: 4, Great Russell Street, W.C.1. [6*d.*] [Review appears also in *Bulletin of Hygiene.*]

The Year Book 1937–38 issued by the Central Council for Health Education gives in convenient form particulars of the various types of health propaganda material available for use in health education work in Great Britain. The information is grouped in seven sections, the first section outlining the aims and activities of the Central Council itself, and the following sections giving particulars of some 75 Health Associations, their addresses, principal officers, constitutions, objects and activities, with notes on their publications (journals, books, pamphlets, leaflets, etc.), their poster services, health week and exhibition services, lecture services (with a panel of lecturers and particulars of subjects and fees), and classified tables of cinematograph films and lantern slides available for use in connexion with Health Weeks and other occasions. The Year Book is likely to prove of great use to anyone engaged in health education work or in organizing a health campaign.

Medical Officers of Health and others may also find useful the lists of medical films issued by the British Film Institute. The Institute's main "Catalogue of British Medical Films of Technical Interest to Medical Practitioners and Students" appeared in 1936 (see this *Bulletin*, 1936, Vol. 33, p. 415] and described about 200 films. The Supplementary Catalogue now published gives particulars of some 100 further films relating to the pre-clinical sciences, general medicine and surgery, hygiene and public health, pathology, and special and miscellaneous subjects such as orthopaedics, paediatrics, tuberculosis, physical training, and hospital management and education.

R. L. S.

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